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CONTENTS

JENSEN—Notes of the potato psyllid, Paratrioza cockerelli (Sulc) 161
CAMRAS—A new species of Zodion from California 165
JEWETT—New stoneflies from California and Oregon 167
BOUDREAUX—New species of Tetranychid mites 181
SEIDEL—Two new dipteran parasites of Autographa californica 186
DENNING—New species of Lepidostoma 187
ROSENSTIEL—Another weevil injurious to strawberries 194
MOORE—Notes on Endeodes LeConte with a description of a new species from Baja California 195
HURD—A polytypic interpretation of the California carpenter bee Xylocopa californica with the description of a new subspecies and notes on a possible polytopic form 199
ROZEN—Morphological description of the larva of Oreopasites vanduzeei Cockerell 203
MOORE—An efficient method of collecting dung beetles 208
BAILEY—A review of the genus Rhipidothrips Uzel 209
PITELKA—Use of bird nest by bumblebee 220
CAUSEY—New records and species of millipedes from the western United States and Canada 221
BELKIN—The dorsal hairless setal ring of mosquito pupae 227
ZOOLOGICAL NOMENCLATURE 179
BOOK NOTICE 208

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THE PAN-PACIFIC ENTOMOLOGIST

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Vol. XXX July, 1954 No. 3

NOTES ON THE POTATO PSYLLID, PARATRIOZA COCKERELLI (SULC)

(Hemiptera: Psyllidae)

D. D. JENSEN

University of California, Berkeley

The potato psyllid, *Paratrioza cockerelli* (Sulc), sporadically has been a major pest of potatoes and less frequently of tomatoes in Utah, Colorado, Wyoming, Montana, Nebraska, and North Dakota. It causes a destructive disease of these plants known as psyllid yellows, which is due to the feeding of the nymphs. The disease symptoms closely resemble those caused by virus, but psyllid yellows apparently results from a toxin rather than a virus introduced by the nymphs.

Considerable work has been done on the relation of the insect to the disease and on the host plants and life history of the psyllid in the areas of greatest damage. However, the site of overwintering and the source of the adult psyllids which infest the early potatoes and other host plants in May and June in the Rocky Mountain states have remained uncertain. The best available evidence indicates that the potato psyllid only rarely survives the winter out of doors in the regions subject to the greatest summer damage. (Wallis, 1946; Pletsch, 1947.).

Romney (1939) reported that *P. cockerelli* breeds abundantly on *Lycium andersonii* A. Gray from January to May in the semi-desert areas of southern Arizona, New Mexico, and Texas below 3,000 feet. He states that the adults disappear from these plants by the middle of June. In late October or November an influx of adults returns to *Lycium* from an unknown source. He suggests that the psyllids produced during the winter in the southern breeding area migrate north and provide the population which infests the fields of Colorado in May and June. He derived additional evidence for this idea from the fact that the beet leafhopper, *Circulifer tenellus* (Baker), is known to make such a movement north and both species were taken in insect traps used in studying the beet leafhopper.

The psyllids are believed to leave the winter breeding plants in the spring because these plants dry up. Moreover the high summer temperatures in many of the southern areas are lethal to

the psyllid, particularly in the egg and nymphal stages.

Current records are adding strong circumstancial evidence for Romney's suggestion that potato psyllids migrate in May and June to the Rocky Mountain States from winter breeding areas in the Southwest.

Wallis (1954) reported that in March 1954 the psyllid populations on *Lycium* in southwestern Texas, southern New Mexico, Arizona, southern California, and southern Nevada were much higher than at any time in the past 10 years. The number of adults per 100 sweeps ranged from 28 in southern Nevada to 128 in Arizona. He cautioned that if weather conditions were right for a northward movement of the psyllids in May and June this could be an epidemic year in some of the northern potato and tomato growing areas.

The Cooperative Economic Insect Report (U.S.D.A.) for May 28, 1954 (Vol. 4, No. 21) carries an indication that a large influx of psyllids did occur into eastern Colorado during the middle of May.

"*Colorado.* Averaging 87 adults per 100 sweeps and many eggs laid. During the 6 days preceding May 20, large movement of adults into eastern counties. Strong indications that an epidemic season may be developing (Daniels). *Utah.* Increased abundance in some localities on matrimonyvine. On basis of 100 sweeps following collected this week: Bountiful 8; Grainger 12, Bennion 8, Spanish Fork 4 to 12, Fayette 12, Centerfield 28, Gunnison 92, (Knowlton). *Arizona.* [Psyllids] Left potato areas of Pinal and Maricopa counties. (Ariz. Coop. Rept.)"

Whether the disappearance of psyllids from Pinal and Maricopa Counties in Arizona was due to migration or death of the psyllids was not reported. U. S. Weather Bureau records show that temperatures in this area reached as high as 114° F. with an average daily maximum of 93° during May, 1954. According to List (1939) the optimum temperature for *P. cockerelli* is 80 degrees and temperatures over 90 degrees are severely deleterious. He noted also that "high temperatues make the adults very restless and may cause them to take flight and thus reach air currents that carry them great distances."

Certain recent collections of *Paratrioza cockerelli* adults in California and Nevada are of interest in connection with the overwintering of the species and because of the preference indicated

by the adults for certain plants outside of the Solanaceae—the family to which all known breeding host plants belong.

On April 2, 1951, P. D. Hurd and J. W. MacSwain (University of California, Berkeley) found adult potato psyllids on *Ephedra* sp. (Gnetaceae) in great abundance at Cima, San Bernardino County, California. The presence of the psyllids on this plant appeared to be more than mere random chance because comparatively few psyllids were found on other plant species in this relatively barren area.

Two years later, on April 1, 1953, Dr. MacSwain found adult psyllids in incredibly large numbers at an elevation of 5,000 feet in the Charleston Mountains, Clark County, Nevada, approximately 20 miles northwest of Las Vegas. In this area the night temperature reached freezing during this period.

The very dark-colored adults were present on certain plants, such as *Arctostaphylos pungens* and *Garrya flavescens*, in such numbers that two sweeps of the net against the side of a bush yielded over one thousand adults when shaken down into the bottom of the net and emptied into a bottle.

The population on *Pinus monophylla* was heavy but not as dense as on *Arctostaphylos* or *Garrya*. The population on *Juniperus Utahensis* was light to moderate and that on *Larreya tridentata* was light. Certain plants, such as *Cercocarpus*, were comapratively free of psyllids.

The breeding hosts and origin of these psyllids are unknown. Those collected at Cima, in 1951, were apparently migrating because there were no solanaceous plants in the vicinity on which they could have bred. Although Clokey (1951) lists *Nicotiana*, *Datura*, *Physalis*, *Solanum* and *Lycium andersonii* as solanaceous plants occuring in the Charleston Mountains, it seems improbable that this large population of psyllids had been produced locally as a spring generation. The breeding hosts (primarily *Lycium andersonii)* occur at approximately 4,000 feet elevation, and it is unlikely that the winter climate in this area would have been mild enough to produce the high populations found at 5,000 feet April 1, on plants which were not breeding hosts of the psyllid.

It seems more probable that the psyllids collected at Cima and in the Charleston Mountains were produced elsewhere in southern California and southern Nevada and had been carried north by wind currents.

Romney's observations of potato psyllid disappearance from southern Arizona, New Mexico, and Texas in the spring, and an influx in the fall seems to have its parallel in southern California as well. Dr. R. C. Dickson, University of California, Riverside, informed the writer that he checked certain solanaceous plants in the Imperial Valley every two weeks during the late summer and fall of 1952 for insects and virus diseases. He found that *Lycium* plants at Niland, which had been free of psyllids two weeks earlier, were heavily infested with adult psyllids early in November.

According to U. S. Weather Bureau records, air movements associated with storm centers and about high pressure areas could theoretically explain the movement of psyllids in wind currents between the southern California-Arizona area and the Inter-Mountain region.

In the fall months, high pressure areas commonly occur in the Great Basin, typically in Nevada. These result in a flow of air across southern Idaho, Utah, Arizona, and out to sea across southern California. This air movement frequently develops into winds, sometimes called Santa Ana winds, which result from the air becoming funneled down some of the canyons south of the Tehachapi Mountains. Such air movement could transport adult psyllids from the Inter-Mountain States to the southwestern areas.

In the spring, the high pressure areas more commonly occur in the midwest and the flow of air is in the opposite direction, moving from southern California into the Inter-mountan States. Populations of psyllids overwintering or being produced in the southwest during the winter and spring months could be transported into the Inter-mountain regions during May and June.

The feasibility of the idea that psyllids might be carried long distances in the air is supported by the fact that Glick (1939), collecting insects by airplane in Durango, Mexico, took *P. cockerelli* more frequently than any other insect species at all altitudes from 100 feet to 4,000 feet.

Other recent collections of the potato psyllid from non-cultivated areas include the following: adults abundant on *Phacelia* sp., 7 miles east of Walker Pass, Kern County, California, April 25, 1952 (P. D. Hurd, Jr.); adults on *Lepidospartum squamatum*, 30 miles east of Sells, Pima County, Arizona, October 29, 1952 (E. G. Linsley and R. F. Smith); a few adults taken on *Artemisia tridentata*, *Pinus flexulis*, and *P. aristata*, White Mountain Station

(10,200 feet elevation), Mono County, California, April 25, June 23, 1953 (J. W. MacSwain).

It is hoped that by calling attention to this interesting problem, more entomologists in the western states will make observations and collections which may aid in clarifying this aspect of the potato psyllid's ecology.

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A NEW SPECIES OF ZODION FROM CALIFORNIA

(Diptera: Conopidae)

SIDNEY CAMRAS
Chicago, Illinois

Examination of the Conopidae of the California Insect Survey, University of California through the courtesy of P. D. Hurd, Jr., reveals the following new species from the extreme south and southeastern part of California.

Zodion californicum Camras, new species

Vertex black; ocelli and vertex at anterior margin of ocellar triangle brownish. Front, face, and cheeks yellow; the front brighter, and the cheeks more silvery pollinose. Antennae dark brown, the distal lower half of the

second segment yellowish. Second segment about 3 X length of the retracted first segment. Third segment about one-half length of second. Arista black. Proboscis black, about 1 1/3 X head height. Occiput gray.

Thorax gray pollinose with narrow black median line. Faint narrow submedian lines present anteriorly. Sublateral lines fused with lateral spots, making dorsum of thorax predominently black. Scutellum with six marginal bristles. Legs gray with yellowish at apices of femora and bases of tibiae. Proximal tarsal segments brownish, distal segments black. Pulvilli and claws yellow; tips of claws black. Wings hyaline, suffused with dusky. Calypters whitish; halteres yellowish. First posterior cell open. *Abdomen* gray pollinose, first segment blackish dorsally. Second and third segments with dorsal triangular black marks pointing anteriorly, and black marks anterolaterally, giving the pollinose areas an oblique pattern. Fourth segment with two dark marks distally. Fifth and sixth segments with narrow black transverse lines at base, and sixth segment with similar line at apical margin. Genital segments shining black. Genital plate very short and thick. Size 8½ mm.

Holotype ♀: CALIFORNIA: RIPLEY, RIVERSIDE COUNTY, 26. VI. 46, W. F. Barr, (sweeping alfalfa), University of California Collection. Deposited in the California Academy of Sciences. Paratype ♀ California: Blythe, Riverside County, 22. VI. 46, W. F. Barr (University of California). Similar to holotype, but black areas darker and slightly more extensive, especially on the antennae. Size 7.5 mm. Paratype ♀. California: Ripley, Riverside County, 2. VII. 46, W. F. Barr (author's collection). Similar to holotype, but black areas paler. Vertex and dark areas on proximal segments of abdomen partly brownish. Size 8.5 mm. Paratype ♀. California: Barrett Springs, San Diego County, 20. IV. 50, J. W. MacSwain (University of California). Similar to holotype, but dark areas paler, antennae and front slightly rufous. Second and third antennal segments equal. Cheeks very large, equal to eye height. Lateral spots on thorax nearly absent leaving dorsum of thorax predominantly gray pollinose. Legs predominantly black. Distal abdominal segments more black, less pollinose. Proboscis longer, about one and two-thirds x head height. Size 9 mm.

This species is related to *obliquefasciatum* differing by the complete absence of any rufous coloration. From *cyanescens* it differs immediately by the absence of bluish coloration, and from *albonotatum* by the lack of yellow pollen and different pattern of the abdomen.

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NEW STONEFLIES FROM CALIFORNIA AND OREGON

(Plecoptera)

STANLEY G. JEWETT, JR.

7742 S. E. 27th Avenue, Portland, Oregon

In studying a large number of stoneflies from western North America, collected by the writer and others, several new species have been found, the sexes have been associated for several species, and it seems necessary to propose new generic or subgeneric names for certain forms. Fourteen such species, of which eight are new, are treated below.

The writer is indebted to Dr. E. S. Ross, California Academy of Sciences, Dr. Robert L. Usinger, University of California, and to Mr. Harry P. Chandler, California Fish and Game Department, for sending material upon which a part of this paper is based.

PELTOPERLA (SOLIPERLA) THYRA Needham and Smith

1916. *Peltoperla thyra* Needham and Smith, Can. Ent., 48:87, male.
1925. *Peltoperla thyra* Needham and Claassen, Monog. Plecop., pp. 170–171.
1952. *Peltoperla (Soliperla) thyra* Ricker, Syst. Studies Plecop., p. 157, placed in new subgenus *Soliperla*.

Among material of *Soliperla* from the collection of the California Academy of Sciences are two males and five females which are considered to be specifically identical with the type of *P. thyra* from Nevada. Dr. Henry Dietrich of Cornell University kindly loaned the type of *thyra* for examination, and it agrees with the males from California in all details except that the sclerotized structure of the aedeagus in ventral view appears to be composed of a single pair of smooth-surfaced appendages, divergent at the tips and tapering to sharp points, whereas the California males have a small pointed spine or tooth midway between the base and tip of each long appendage. The ninth segment of the type of *thyra* is mounted on a slide, and the details of the aedeagal structure are not clearly visible; auxillary spines may be present but are not readily seen.

Female.—In general features similar to the male except for slightly larger size. The subgenital plate is produced over the ninth sternite and is very similar to that of *P. campanula*, described below, but is perhaps somewhat shorter in length.

Allotype female — 6 MILES SOUTH OF MIDDLETOWN, LAKE COUNTY, CALIFORNIA, May 12, 1926, deposited in the collection of the California Academy of Sciences. A male and four additional females were taken with the allotype, and an additional male was collected the day before, May 11, 1926, at the same locality.

Peltoperla (Soliperla) campanula Jewett, new species

Length to wing tips: male 16–17 mm.; female 18–20 mm. Length of body: male 11–12 mm.; female 13–14 mm.

General color dull yellowish brown. Head short, not as wide at compound

eyes as posterior width of pronotum but as wide as the anterior border. Head yellowish with a dark area between and anterior to the ocelli. Distance between ocelli about the same as distance of either to compound eye. Pronotum with a median, somewhat irregular brown stripe; discs yellowish with dark brown rugosities; not quite twice as wide as long, front angles sharp, hind angles broadly rounded. Mesonotum and metanotum brown. Wings not infuscated. Dorsum of abdomen yellowish-brown. Legs brownish dorsally, yellowish-brown ventrally. Antennae and cerci light brown. Cerci with 13 to 15 segments, the basal segment being about as long as the combined length of next three. Two pairs of thoracic gills present, one each on the sides of the meso- and metathorax above and slightly behind the coxae. Each gill is a single thick filiment at most about two and one half times as long as wide. Cervical gills absent.

Male.—Ninth abdominal sternite bearing a median, slightly raised transverse lobe behind which there is a depressed U-shaped area, distal portion of which is upturned and broadly rounded; ninth tergite unmodified; supra-anal process short and recurved with a heavily sclerotized median structure that is expanded at distal end and bears a row of short teeth across lower edge of front margin (fig. 1B); in dorsal view this structure is widely expanded at distal end (fig. 1A); a flap-like membranous structure lies at either side of median structure as in (fig. 1). Aedeagus in shape of large membranous sac bearing two irregular rows of short sclerotized spinules on its ventral surface (fig. 1C), these usually visible through wall of ninth sternite when aedeagus is in retracted, normal position; dorsally near base are two small mebranous lobes at either side, each bearing a short, slender spine; tenth segment narrow; tergite about one-fourth as wide as that of eighth segment, sternite about a third that of eighth segment.

Female.—Similar in general features to male but somewhat larger. Subgenital plate produced over ninth sternite and broadly rounded, without a notch, about twice as long as seventh sternite (fig. 1D).

Nymph.—A mature nymph taken at the same locality on the same date as the holotype is described as follows: Length of body: 13 mm. Body brown, roach-like, covered with fine light hairs. External gills as described above for adult. Stout spines or bristles distributed as follows: on all borders of pronotum with those on front margin longest, and in a small patch near middle of rear margin; in a transverse row across middle of mesonotum and metanotum; scattered on wing covers and on their outer and posterior borders, with a prominent patch near posterior margin of each cover; as a fringe around entire margin of anterior ventral plate of thorax, and on sides and posterior margins of other two plates; as a fringe completely around hind margin of each abdominal segment; as a fringe around each of twenty-four segments of right cercus (some segments of left cercus missing); on subanal lobes; a row each on anterior and posterior outer margins of coxae; a row on posterior outer margin of trochanter; along upper and lower outer margins of femur and in a terminal band; in three longitudinal rows and terminal band on tibia. The femur is deeply grooved below on its outer end to hold the tibia when folded. Each sternum of thorax with a plate overlapping backwards (fig. 1E).

The mouthparts differ from described nymphs of other *Peltoperlae* from western North America. Galea much exceeding the lacinia, with a tuft of hairs at the tip (fig. 1G); lacinia with a broad blunt tip that is somewhat excavated ventrally and with no inner spines; paraglossae curved and slightly longer than the glossae (fig. 1F), without a small segment at the tip; mandibles with a few wedge-shaped teeth and a curved hard surface behind them.

Holotype male and *allotype* female—Oxbow Springs, Hood River County, Oregon, May 19, 1940, S. G. Jewett, Jr. Paratypes, all from Oregon, as follows: same data as for holotype and allotype, ten males, one female; same data except April 18, 1940, two males; same data except May 26, 1940, six males, three females; Wahkeena Falls, Multnomah County, May 3, 1947, S. G. Jewett, Jr., seven males, two females (one pair in copula); Silver Creek Falls, Marion County, July 14, 1934, J. Schuh (Illinois Natural History Survey collection), one male; same locality except August 2, 1948, K. M. Fender, one male, one female; Hood River Meadows, Hood River County, July 18, 1947, K. M. Fender, one male. Holotype and allotype deposited in the collection of the California Academy of Sciences. Paratypes deposited in the collections of the following: the writer, Wm. E. Ricker, California Academy of Sciences, Cornell University, and the Illinois Natural History Survey.

This new species is close to *Peltoperla (Soliperla) thyra* Needham and Smith, but is readily separated from that species in having an unmodified ninth tergite and in details of the male genitalia, in particular the row of small sclerotized spinules of the aedeagus.

Peltoperla (Soliperla) quadrispinula Jewett, new species

Generally similar to *P. campanula*, described above, in size and color.

Male—Ninth abdominal sternite with a lobe similar in size and shape to that of *P. campanula*, and the shape of the sternite is much as in that species; ninth tergite shallowly excavated on hind margin as described for *P. thyra*. Supra-anal process very similar to that of *P. campanula* in size and shape. Aedeagus bears two pairs of long, sclerotized spines (fig. 2), which can usually be seen through wall of ninth sternite when aedeagus is in retracted, normal position. Tenth segment similar to that of *P. campanula*.

Female—Subgenital plate is produced over ninth sternite and broadly rounded as in *P. campanula* and *P. thyra*, and on the basis of available material cannot with certainty be separated from these species.

Holotype male and *allotype* female: Wrangle Gap Camp, Rogue River National Forest, Jackson County, Oregon, Aug-

ust 11, 1950, K. M. Fender. Paratypes as follows: same data as for holotype and allotype, one male; Coffee Creek, Trinity County, California, June 7, 1934, E. C. Van Dyke, one male. Holotype and allotype deposited in the collection of the California Academy of Sciences. Paratypes deposited in the collections of the writer and the California Academy of Sciences.

In addition to the above material, the writer's collection contains a male and a female of this species from a small tributary of Big Creek, Clatsop County, Oregon, taken by him May 28, 1949; these specimens are excluded from the paratypic series because the aedeagus of the male has been lost.

This new species is readily distinguished from allied species in the male by the sclerotized spiny structures in the aedeagus and is separated from *P. companula* by the slightly depressed posterior portion of the ninth tergite.

Sierraperla Jewett, new subgenus

Study of both adult and nymphal material of *Peltoperla cora* Needham and Smith reveals that the shape and location of the gills are different from those of species of the subgenus *Yoraperla* Ricker or other described subgenera of *Peltoperla*, and the nymph differs in additional details. It is therefore felt necessary to propose a new monotypic subgenus for the species *cora*, a description of the nymph of which follows.

Type of subgenus: *Peltoperla cora* Needham and Smith.

PELTOPERLA (SIERRAPERLA) CORA Needham and Smith

1916. *Peltoperla cora* Needham and Smith, Can Ent., 48:86, male and female.
1925. *Peltoperla cora* Needham and Claassen, Monog. Plecop. pp. 172–173.
1952. *Peltoperla (Yoraperla) cora* Ricker, Syst. Studies Plecop., p. 157, placed in new subgenus *Yoraperla*.

A nearly mature nymph from Howell's, Plumas County, California, collected August 29, 1946, by Harry P. Chandler, is described as follows:

Length of body 13 mm. Body brown, some fine, pilose hairs on body but general appearance is smooth, roach-like in aspect although less so than are species of the subgenus *Yoraperla*. Stout spines or bristles distributed as follows: at outer anterior and posterior corners of pronotum; on lateral and hind margins of the mesonotal and metanotal wing covers (sparse on this specimen which may not be typical in this respect); on lateral margins of head below compound eyes; as a border completely around hind margin of last three abdominal segments, as a border across sterna of next three seg-

ments, absent or nearly so on first three segments; as a fringe around anterior border of twenty-one segments of the cercus (distal segment or more missing); on subanal lobes; on the outer borders of coxae; on outer border of trochanter; on sides and distal end of outer face of flattened femur; on sides and distal end of outer face of little-flattened tibia. Femur grooved below, tibia capable of folding back along its inner, lower margin; sternal plates overlapping posteriorly (fig. 3). One pair of external gills, finger-like, in cervical region; two gills, one above the other and posterior to each coxae of prothorax and mesothorax; and one gill behind each coxae on the metathorax in the position of upper gills on prothorax and mesothorax. Upper gills on each segment bilobed, forming a T, the arms extending dorsad and ventrad; a basal stub or short lobe present on lower gill of prothorax and mesothorax; all gills robust. Posterior portion of terminal abdominal tergite of nymph greatly extended posteriorly and upturned to a pointed tip, resembling that of some species of *Pteronarcys*. Galea about equal to lacinia in length, tip turned slightly outward and with a tuft of fine hairs (fig. 3B); lacinia with an outer and inner tooth, tips of both chisel-shaped; paraglossae slightly curved, and only a little longer than glossae (fig. 3A).

Nemoura wahkeena Jewett, new species

Length to end of body: male 4 mm.; female 4–5 mm.; both sexes brachypterous. General color light brown. Four cervical gills, each composed of two compressed filaments which are branched once or twice beyond the base; length of each gill about six times its width at the base. Head wider than pronotum, dark brown except for a paler area beyond the anterior ocellus. Pronotum about as wide as long, narrowed in width posteriorly and with the angles broadly rounded, generally dark with light lateral and posterior margins. Forewing reaching to about the middle of the metanotum, hind wings slightly shorter. Antennae composed of 27–32 segments, equal to or slightly greater than the length of body.

Male—Abdominal segments brown, the eighth, ninth, and tenth most heavily sclerotized; ninth tergite posteriorly with wide crescentic membranous area; ninth sternite greatly produced behind and with a lobe. Cerci small, curved, sclerotized on outer faces, concave and membranous on inner faces, tipped with a tiny robust spine. Supra-anal process recurved, and from above, widest in the middle as in (fig. 4), membranous dorsally, sclerotized ventrally. Subanal lobes double, an inner strongly sclerotized lobe which ends in a tapered, outwardly-directed point and an outer lobe which is membranous.

Female—In general features similar to male. Cerci are unmodified. Seventh sternite bulbous, membranous, extending over anterior half of eighth sternite (fig. 4B); eighth sternite largely sclerotized, on posterior median margin is visible a strongly sclerotized narrow ring surrounding oviduct; ninth sternite is largely sclerotized, tenth, only slightly so.

Holotype male and *allotype* female, taken in copula: WAHKEENA FALLS, MULTNOMAH COUNTY, OREGON, April 5, 1947, S. G. Jewett, Jr. Paratypes: three males, five females, including a pair in copula, same data as for holotype and allotype. Holotype and allotype

deposited in the collection of the California Academy of Sciences. Paratypes deposited in the collections of the writer, Wm. E. Ricker, and the Illinois Natural History Survey.

This distinctive small species can be readily separated from described species of *Nemoura* by the extreme brachyptery of both sexes, by the shape of the gills, and by the distinctive subanal lobes of the male. The male supra-anal process, particularly its expanded middle portion in dorsal view, also distinguishes it from described males of the subgenus *Zapada* Ricker to which it is tentatively assigned.

Nemoura spiniloba Jewett, new species

Male—Length to end of body: 6 mm. Length to wing tips: 8 mm. General color brown. No external gills in male holotype. Head dark brown, wider than pronotum; pronotum generally dark in color, wider than long, narrowed posteriorly with anterior angles rather sharp, posterior angles broadly rounded; wings normal. Antennae with more than fourteen segments, second segment smaller than large basal segment, about one-half as long as third segment. Abdominal segments brown, first eight without significant sclerotization, ninth and tenth segments wholly sclerotized; ninth sternite produced posteriorly into a lobe and with the usual lobe from its anterior margin (fig. 5A), Cerci sclerotized, a tiny spine at tip. Supra-anal process recurved to posterior border of tenth tergite, wider than deep, and with a slightly enlarged tip from above and from the side, more heavily sclerotized ventrally than dorsally (fig. 5). Subanal lobes broad at base, quadrangular, and with a slender acute process developed from the inner margin (fig. 5A).

Holotype male: WOODACRE, MARIN COUNTY, CALIFORNIA, March 31, 1949, L. W. Quate. Deposited in the collection of the California Academy of Sciences.

The genitalia of this new species resemble those of *N. cataractae* Neave but are readily separated by the shape of the cerci and subanal lobes. Should additional material agree with the holotype in lacking gills on the mentum or in the cervical region, it may become advisable to erect a new subgenus for this species. The holotype was a pinned specimen which has been relaxed and preserved in alcohol.

EXPLANATION OF FIGURES

Fig. 1. *Peltoperla (Soliperla) campanula,* male genitalia, lateral aspect; 1A, supra-anal process, from above; 1B, supra-anal process, distal end from below; 1C, aedeagus extruded, ventral aspect; 1D, female subgenital plate; 1E, sternal plates of nymph; 1F, labium of nymph; 1G, maxilla of nymph.

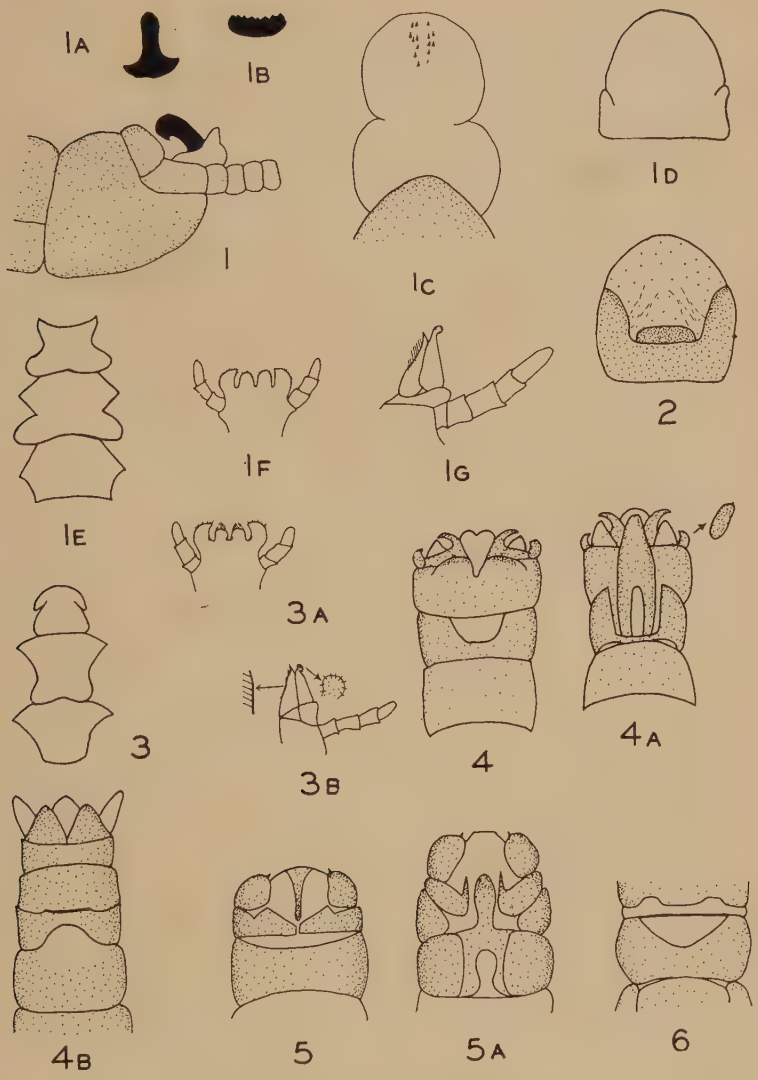


Fig. 2. *Peltoperla (Soliperla) quadrispinula,* male genitalia, aedeagal structure through ninth sternite. Fig. 3. *Peltoperla (Sierraperla) cora,* sternal plates of nymph; 3A, labium of nymph; 3B, maxilla of nymph. Fig. 4. *Nemoura wahkeena,* male genitalia, dorsal aspect; 4A, male genitalia, ventral aspect; 4B, terminal sternites of female. Fig. 5. *Nemoura spiniloba,* male genitalia, dorsal aspect; 5A, male genitalia, ventral aspect. Fig. 6. *Capnia californica,* eighth sternite of female.

Capnia maculata Jewett, new species

Length to wing tips: male holotype 9 mm.; female allotype 11 mm. Length of body: male holotype 7.5 mm.; female allotype 8 mm.

General color in alcohol brown. Head through compound eyes wider than pronotum; lateral ocelli about twice as far apart as distance from inner margins of compound eyes; median ocellus about as far forward from lateral ocelli as distance between them. Pronotum slightly wider than long, with a distinct median logitudinal line, embossed. Venation of wings typical, with R_1 bent upward at its origin and with A_1 bent abruptly caudad at its junction with cu-a and then curved outwardly again. Wings conspicuously spotted, particularly on the outer half of the forewing and the radial area of the hind wing.

Male—First eight abdominal segments without special structures; ninth sternite with a prominent lobe at base (fig. 7). Subanal lobes fused distally to form a slender, sharp point. Ninth tergite with a pair of heavily sclerotized knobs on anterior half of sclerite. Supra-anal process of tenth tergite almost square in cross-section, recurved, with blunt tip resting between knobs of ninth tergite. Cerci long, many-segmented.

Female—Eighth abdominal sternite (fig. 7A), with a subgenital plate which occupies central part of sternite, distal portion of which extends well beyond posterior margin of segment. A broad median membranous stripe extends longitudinally across tergites one through eight.

Holotype male: Marsh Creek, Contra Costa County, California, March 6, 1950, L. W. Quate. *Allotype* female; Colorado Creek and Mines Road, Santa Clara County, California, April 6, 1949, Ray F. Smith. Paratype female: Livermore, Alameda County, California, March 31, 1929, E. C. Van Dyke. Holotype and allotype deposited in the collection of the California Academy of Sciences, the paratype deposited in the writer's collection.

This new species differs from all previously described North American species of *Capnia* in having spotted wings and in possessing a ventral appendage on the ninth sternite of the male. It bears resemblance to such Asiatic species as *C. cordata* Kimmins which has "faint smoky clouds" in the apical half of the wings, a bifurcate knob on the ninth tergite, and a ventral lobe on the ninth sternite.

Capnia licina Jewett, new species

Male—Similar in general morphological details to other species of the genus *Capnia*. Length to wing tips: 6 mm. Length of body: 5.5 mm.

General color brown, wings hyaline. First six abdominal tergites without special structures; seventh, eighth, and ninth, tergites (fig. 8), with median raised tubercles, that of eighth most prominent; tenth tergite notched medially; membranous areas present on seventh and eighth tergites behind tuber-

cles and anterior to tubercle on ninth tergite. Supra-anal process reflexed, tip upturned and nearly reaching posterior margin of eighth tergite; length of supra-anal process equal to 8 to 10 times its diameter at middle.

Holotype male: SMALL CREEK AT THE JUNCTION OF OREGON HIGHWAYS NUMBERS 36 AND 50, CLACKAMAS COUNTY, OREGON, April 22, 1948, S. G. Jewett, Jr. Deposited in the collection of the writer.

This species differs from other described species of North American *Capnia* in possessing both tubercles on tergites 7 to 9 and a reflexed supra-anal process with the tip upturned. The length of the process is less than that of other species where the tip is upturned.

CAPNIA CALIFORNICA Claassen

1924. *Capnia californica Claassen*, Can. Ent., 56:57, male.
1925. *Capnia californica* Needham and Claassen, Monog. Plecop., pp. 262–263.

Female—Similar in general morphological details to male. Length to wing tips: 8 mm. Length of body: 6–7 mm.

Eighth abdominal sternite (fig. 6), with subgenital plate well developed, sclerotized as in figure 6, not fused with seventh sternite; distal end of plate is bordered by a heavily-sclerotized band; membranous area on eighth sternite varies in shape, almost triangular to crescentic; usual, broad, membranous median stripe extends longitudinally across the first eight tergites.

Allotype female—A small creek near Saratoga, Santa Clara County, California, February 25, 1940, S. G. Jewett, Jr. Allotype deposited in the collection of the California Academy of Sciences. With the allotype six additional females and seven males were taken.

CAPNIA OREGONA Frison

1942. *Capnia oregona* Frison, Pan-Pac. Ent., 18:2, pp. 63–64, male.

Female—In general features similar to male, both sexes having wings uniformly stained with brown. Eighth abdominal sternite with a subgenital plate as in figure 9; a dark brown pigmented area occurs on either side of central, distal portion of sternite, and additional pigmented patches occur on ninth sternite in comparable areas; usual broad median stripe occurs longitudinally across first eight tergites.

Allotype female—Benton County, Oregon, 14 miles south of Corvallis, Muddy Creek, February 10, 1938, S. G. Jewett, Jr. Deposited in the collection of the California Academy of Sciences.

The allotype was taken with the holotype and several other specimens of this species, but Frison apparently failed to note the distinctive wing color of this species and consequently did not associate the sexes.

Rickera Jewett, new genus

This genus, erected for the new species described below, is tentatively placed in the Isoperlinae because in the male the tenth tergite is entire, and the male subanal lobes resemble those of some species of *Isoperla*. The head and thorax color pattern, the shape of the female subgenital plate, and the lobe on the seventh sternite of the male strongly suggest *Isogenus* in the subfamily Isogeninae as defined by Ricker (1952).

Type of genus: *Rickera venusta* Jewett.

Rickera venusta Jewett, new species

Length to wing tips: male 17-18 mm.; female 20 mm. Length of body: male 12 –14 mm.; female 14–16 mm. General color gray-brown with yellow markings on head and thorax and with fumose wings.

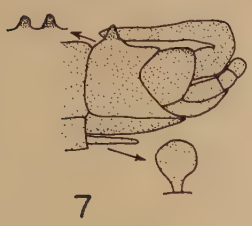
Head at compound eyes slightly wider than prothorax, mostly yellow within ocellar triangle, a large yellow spot anterior to forward ocellus, head yellow behind posterior ocelli except for brownish areas on either side behind the compound eyes. Prothorax with a wide, central yellow band which diffuses into lateral brownish areas, stripe occupying one-fourth to one-third of prothoracic width; prothorax distinctly wider than long, both anterior and posterior angles rounded. First tarsal segment about twice as long as second, the third, two or three times as long as the first and second combined. Wings fumose; subcosta not reaching the cord; a series of several costal crossveins before end of subcosta and two or three beyond in both fore and hind wings; radial sector forked twice beyond the cord. Abdomen with a narrow, median, dorsal stripe that extends across first eight tergites.

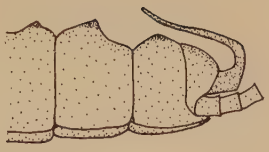
Male—Subanal lobes (fig. 10) erect, mostly membranous. No supra-anal process. A lobe with an uneven distal margin is present on posterior margin of seventh sternite fig. 10A).

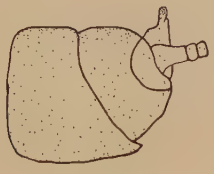
Female—Subgenital plate (fig. 10B) wide, extending across anterior half of ninth sternite, its tip broadly rounded.

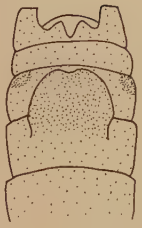
Holotype male and *allotype* female: Rogue River at Muir Creek, Jackson County, Oregon, June 17, 1949, S. G. Jewett, Jr. Paratypes as follows: Rogue River at Foster Creek, Jackson County, Oregon, June 17, 1949, S. G. Jewett, Jr., two females; Clear Creek, Wasco County, Oregon, June 19, 1952, S. G. Jewett, Jr., one male; Olallie Creek Forest Camp, McKenzie River, Lane County, Oregon, July 15, 1952, S. G. Jewett, Jr., one male. Holotype and allotype deposited in the collection of the California Academy of Sciences. Paratypes are in the collections of the writer and Wm. E. Ricker.

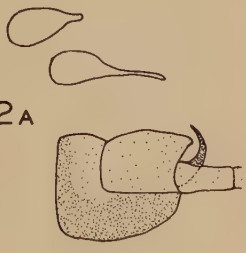
This new genus is named in honor of Dr. Wm. E. Ricker who has done so much on the taxonomy and phylogeny of Plecoptera.

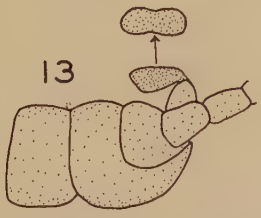


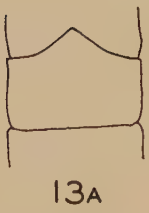












EXPLANATION OF FIGURES

Fig. 7. *Capnia maculata,* male genitalia, lateral aspect; 7A, eighth sternite of female. Fig. 8. *Capnia licina,* male genitalia, lateral aspect. Fig. 9. *Capnia oregona,* eighth sternite of female. Fig. 10. *Rickera venusta,* male genitalia, lateral aspect; 10A, lobe on male seventh sternite; 10B, terminal sternites of female. Fig. 11. *Isogenus (Kogotus) alameda,* terminal sternites of female. Fig. 12. *Isoperla marmorata,* male genitalia, lateral aspect; 12A, two examples of aedeagal structure; 12B, lobe on male eighth sternite. Fig. 13. *Alloperla (Alloperla) chandleri,* male genitalia, lateral aspect; 13A, eighth sternite of female.

ISOGENUS (KOGOTUS) ALAMEDA (Needham and Claassen)

1925. *Perla alameda* Needham and Claassen, Monog. Plecop., pp. 78-79, male.
1952. *Isogenus alameda* Ricker, Syst. Studies Plecop., p. 128, placed in *Isogenus* and suggested as belonging in *Kogotus*.

Female—Subgenital plate occupies middle half of eighth sternite and extends posteriorly to anterior margin of tenth sternite, broadly rounded with or without a wide shallow emargination (fig. 11).

Allotype female—Pinnacles National Monument, San Benito County, California, May 3, 1946, H. P. Chandler. Deposited in the collection of the California Academy of Sciences.

This species is assigned to the subgenus *Kogotus* Ricker (1952) because the tip of the anterior band is coiled inside of the supra-anal process. The paragenital plates are produced upward into rounded, spinulose tips.

Since this species has been recorded only from San Antonio Creek, Alameda County, the following additional California records are listed: Same as allotype, one male; Lake Curry, Solano City, Lake County, April 13, 1950, J. N. Simons, one male; Livermore, Alameda County, May 11, 1930, E. C. Van Dyke, three males, one female; Pope Valley, Napa County, May 8, 1930, E. C. Van Dyke, two females; Livermore, April 30, 1928, one female.

ISOPERLA MARMORATA (Needham and Claassen)

1925. *Clioperla marmorata* Needham and Claassen, Monog. Plecop., pp. 142–143, female.

Male—Generally similar in morphological details to female but somewhat smaller in size. Subanal lobes cylindrical, recurved, and bluntly tipped (fig. 12). Eighth sternite with a shallow, broadly rounded lobe on posterior portion (fig. 12B) which does not extend beyond end of segment. Aedeagus with a sclerotized, translucent process, blade-like at distal end, teardrop shaped in lateral view (fig. 12A); in some specimens base of process is finger-like, in others it appears to taper rapidly to a blunt, rounded end.

Marmorata differs from described species of *Isoperla* from western North America in having the anal area of the hind wings fumose, sometimes lightly so, sometimes more heavily, as in the holotype. The head color pattern as described for the holotype, the cylindrical subanal lobes of the male, and the scarcely extended subgenital plate of the female also differentiate it from described species.

Allotype male—Eagle Creek, Clackamas County, Oregon, April 16, 1940, S. G. Jewett, Jr. Deposited in the collection of the California Academy of Sciences.

The following additional material of this species has been ex-

amined: Same data as for allotype: seven males, one female; same data except May 5, 1940, two males, five females; same data except June 27, 1948, one male; Soap Creek, Benton County, Oregon, May 24, 1947, E. Holmberg, one male; 3 miles south Camino, Eldorado County, California, June 26, 1948, D. Carter, two males, two females; Middletown, Lake County, California, May 11, 1926, three males; tributaries of Smith Creek, elevation about 5,000 feet, Blairsden, Plumas County, California, June 11, 1952, Wm. E. Ricker, one male, one female, one exuvia.

Alloperla (Alloperla) chandleri Jewett, new species

Male—Typical in color for members of the subgenus *Alloperla*, without dark markings on head, thorax, or abdominal segments, presumably greenish in life. Supra-anal process (fig. 13) membranous basally with anterior sclerotized portion bent forward and hinged so that it can be moved vertically on its attachment with membranous basal portion; tip of process is flat in end view; dorsally process is slightly dumbbell-shaped.

Female—Subgenital plate (fig. 13A) slopes caudally abruptly towards its center to form a pointed process which reaches anterior border of ninth sternite.

Holotype male, *allotype* female, two male paratypes, and one female paratype: 6 MILES EAST OF MIAMI RANGER STATION, ELEVATION 6,000 FEET, MARIPOSA COUNTY, CALIFORNIA, July 4, 1946, Harry P. Chandler. Holotype and allotype deposited in the collection of the California Academy of Sciences, paratypes in the collections of H. P. Chandler and the writer.

This new species differs from other described species of *Alloperla* proper, from western North America in the shape of the male supra-anal process. From *A. elevata* Frison, to which it bears some resemblance, *chandleri* is readily separated by the thickness of the tip of the supra-anal process which is about as deep as broad whereas in *elevata* it is quite thin in lateral view.

ZOOLOGICAL NOMENCLATURE: NOTICE OF PROPOSED SUSPENSION OF THE RULES IN CERTAIN CASES FOR THE AVOIDANCE OF CONFUSION AND THE VALIDATION OF CURRENT NOMENCLATORIAL PRACTICE (A. [N.S.] 18)

Notice is hereby given that the possible use by the International Commission on Zoological Nomenclature of its Plenary Powers is involved in applications relating to the under-mentioned names.

Under the decision by the International Congress of Zoology the period within which comments on the applications covered by the present Notice are receivable is a period of six calendar months calculated from the date of publication of the revelant Part of the Bulletin of Zoological Nomenclature.

(1) Applications in Part 6 of Vol. 9

(1) *immigrans* Sturtevant, 1921, as published in the combination *Drosophila immigrans* (Class Insecta, Order Diptera), proposed validation of (pp. 161-162) (File Z.N. [S.] 711).

(2) *pruni* Geoffroy, 1762, as published in the combination *Aphis pruni* (Class Insecta, Order Hemiptera), proposed validation of (pp. 163-165) (File Z.N. [S.] 428).

(3) *Lachnus* Burmeister, 1835, and *Cinara* Westwood, 1835, proposed designation of type species for, in harmony with accustomed usage (Class Insecta, Order Hemiptera) (pp. 174-183) File Z.N. [S.] 174).

(2) Applications in Part 7 of Vol. 9

(4) *Stentor* Oken, 1815(Class Ciliophora), proposed validation of, and designation of a type species in harmony with accustomed usage (pp. 208-213) (File Z. N. [S.] 261).

(5) *Melanargia* Meigen, 1828 (Class Insecta, Order Lepidoptera), proposed validation of (pp. 221-222) (File Z. N. [S.] 708).

(3) Applications in Part 8 of Vol. 9

(6) Geoffroy, 1762, *Historie Abregee des insectes qui se trouvent aux environs de Paris*, proposed validation of the following six names published in, for genera of the Order Diptera: *Stratiomys, Stomoxys, Volucella, Nemotelus, Scatopse, Bibio* (pp. 241-246) (File Z. N. [S.] 710).

(7) *Palmatotriton* Smith, 1945 (Class Amphibia), proposed suppression of (pp. 247–249) (File Z.N. [S.] 594).

(8) *Ammonites mammillatus* Schlotheim, 1813, proposed designation of a neotype for, and *Douvilleiceras* de Grossouvre, 1893 (Class Cephalopoda, Order Ammonoidea), proposed designation of a type species for (pp. 250-254) (File Z.N. [S.] 631).

Any specialist who may desire to comment on any of the foregoing applications is invited to do so in writing to the Secretary to the International Commission (Address: 28 Park Village East, Regent's Park, London, N.W. 1, England) as soon as possible. Every such comment should be clearly marked with the Commission's File Number as given in the present Notice.—FRANCIS HEMMING, *Secretary to the International Commission on Zoological Nomenclature.*

NEW SPECIES OF TETRANYCHID MITES[1]

(Acarina)

H. BRUCE BOUDREAUX

Department of Zoology, Physiology and Entomology, Louisiana State University, Baton Rouge.

The aid given by Dr. A. E. Pritchard and Dr. E. A. McGregor in encouragement and study of mite sepcimens from Louisiana is gratefully acknowledged. The following new species were discovered in the course of this investigation.

Tetranychus merganser Boudreaux, new species

Tetranychus merganser resembles most *T. tumidus* Banks and *T. atlanticus* McGregor. It differs from *tumidus* in lacking the large empodial spur and in having the aedeagus terminating in a rather large distal knob, shaped very much like the head of a merganser duck. From *atlanticus* it differs in being red instead of greenish, and in having a more prominent empodial spur. The aedeagus terminates in a large distal knob, rounded anteriorly and above, and the bend of the shaft closely approaches an angle of 90°, while in *atlanticus* the bend of the external shaft is usually 60°, and the distal knob is smaller with the upper surface very broadly angulate. The empodial spurs of *atlanticus* are quite obscure.

Female.—Palpus with terminal sensillum about twice as long as wide. Stylophore rounded mediodistally. Peritreme chambered, hooked distally, chamber at bend of hook often with a swelling. Tarsus I bearing 4 or 5 tactile setae and one sensory seta proximad of but in vicinity of proximal duplex setae; empodial spur rudimentary; a very tiny bristle usually visible below the three pairs of proximo-ventral hairs. Dorsum between inner lumbar and inner sacral setae with striae transverse and surrounded by a rhomboidal area of striae; striations longitudinal between both inner lumbar and both inner sacral setae. Dorsal setae slender, tapering, weakly pilose and longer than intervals between them. Length of body from posterior end to tip of rostrum 0.54. mm.

Male.—Palpus with terminal sensillum slender, about three times as long as thick. Aedeagus with proximal portion of external shaft parallel sided, narrowing abruptly downward and curving smoothly upward distally, terminating in a large distal knob whose anterior projection is broadly rounded, and whose posterior projection forms a sharp beak; upper surface of distal knob smoothly rounded. Length of body 0.45 mm.

[1] This paper has resulted from a study partly supported by a grant from the Freeport Sulphur Company, and partly by the Louisiana Agricultural Experiment Station at Baton Rouge.

Holotype—Male, BATON ROUGE, LOUISIANA, July 7, 1953 (L. D. Newsom) on *Ligustrum vulgare* L.; type No. 2172 in U. S. National Museum. *Morphotye*—Female, same data as holotype; type deposited in U. S. National Museum. *Paratypes*—Six males and thirty-six females, all from *Ligustrum vulgare*, in collection of the writer. *Localities*—Monroe, Shreveport, Baton Rouge and Natchitoches, Louisiana.

This mite is carmine, with lateral dark spots extending to the posterior end in older females. Very little web is produced, but the leaves show signs of injury in becoming spotted with yellow where a colony is established.

Tetranychus cocosinus Boudreaux, new species

Tetranychus cocosinus is nearly identical in morphological details with *T. cocosi* (McG.). It differs in having the posterior angulation of the distal knob of the aedeagus relatively longer than in *cocosi*, and with the distal knob slightly sigmoid on the upper surface, the tip bending downward. In addition, the terminal sensillum of the palpus of the male is four or more times its thickness, broader at tip, while in *cocosi* the sensillum is about three times as long as thick and parallel-sided. The differences in shape are the same in the females, but the sensillum is shorter than in the males. *T. cocosi* is described as "pale chestnut red" in life and feeds on the royal palm in California. *T. cocosinus* is dark purple, nearly black, and has been collected on *Rubus*, *Rosa*, *Ulmus* and *Celtis* (Hackberry) in Louisiana.

Female.—Body from above broadly rounded. Stylophore rounded mediodistally or very slightly cleft. Terminal sensillum of palpus about twice as long as thick, broader near tip. Tarsus I bearing 4 tactile setae proximad of duplex setae; empodial spur rudimentary but obvious. Striations dorsally between inner lumbar and inner sacral setae as in *T. merganser* above. Dorsal setae slender, weakly pilose and longer than intervals between them. Length of body 0.49 mm.

Male.—Terminal sensillum of palpus slender, one-fourth as thick as long, tip slightly broadened and angulate. Aedeagus with external shaft broad at base, weakly tapering to upward bend where it narrows abruptly, and tipped with a distal knob whose anterior and posterior projections are acute, the anterior one shorter than the posterior projection, which bends slightly downward. Distal knob about three-eighths as long as external shaft, with its axis parallel with upper surface of shaft and its upper surface slightly sigmoid anteriorly. Length of body 0.34 mm.

Holotype—Male, PORT ALLEN, LOUISIANA, Aug. 18, 1953, (H. B. Boudreaux) on *Celtis* sp.; type No. 2174 in U. S. National Museum. *Paratypes*—Nine males and eight females from *Rubus* sp., Natchitoches, La., one male from *Rubus*, Baton Rouge, La., two males and four females from Hackberry, Port Allen, Louisiana, and five males and ten females from *Ulmus americanus*, Baton Rouge, Louisiana. In collection of the writer.

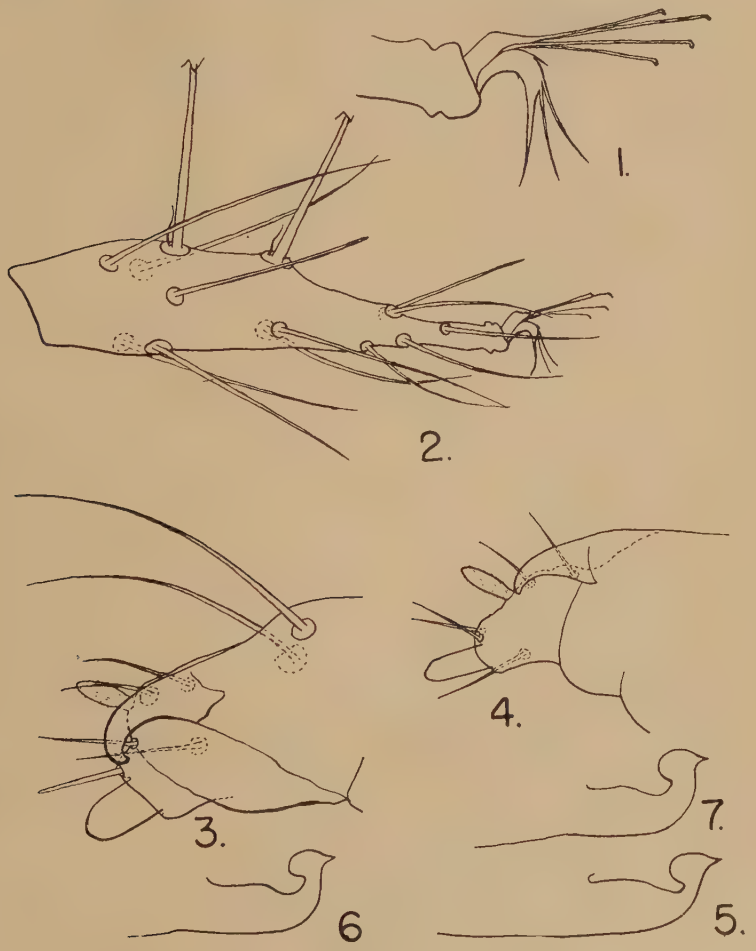


PLATE I

Tetranychus merganser. Fig. 1, female, pretarsus I; Fig. 2, female, tarsus I; Fig. 3, female, palpus; Fig. 4, male, palpus; Fig. 5, male, aedeagus (holotype); Fig. 6 and 7, aedeagus, male paratypes.

Specimens were taken on Rose, Baton Rouge, but they are not included in the type series. The original slides were poorly made, and the specimens were lost in attempting to remount them.

The color in life is dark reddish-purple, some nearly black. Males paler, as usual. Webbing is produced profusely, and *Rubus* leaves are markedly injured.

Tetranychus magnoliae Boudreaux, new species

Tetranychus magnoliae is most closely related to *T. tumidus* Banks and *T. mexicanus* McGregor. All have a prominent empodial spur above the three pairs of empodial hairs on all tarsi. The only

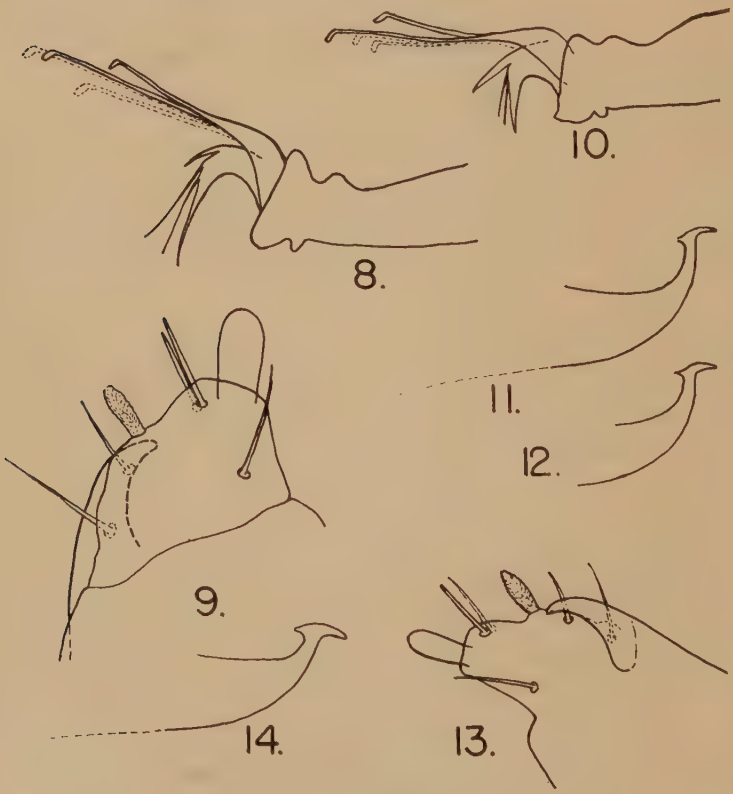


PLATE II.

Figures 8–13. *Tetranychus cocosinus.* Fig. 8, female, pretarsus I; Fig. 9, female, palpus; Fig. 10, male, pretarsus I; Fig. 11, male, aedeagus (holotype); Fig. 12, male, aedeagus of paratype; Fig 13, male, palpus.

Figure 14. *T. cocosi,* aedeagus, male from royal palm, California.

other species with such a spur is *T. braziliensis* McGregor, but the latter has additional small setae and the structure of the empodium if different. *T. magnoliae* males differ from those of *T. tumidus* and *T. mexicanus* in having a much longer posterior angulation on the distal knob of the aedeagus.

Female.—Thickness of terminal sensillum of palpus about three-fifths the length, and its length about the same as that of the dorsal sensillum. Stylophore rounded anteriorly. Peritreme chambered, and hooked distally. Tarsus I bearing 4 or 5 setae proximad of the proximal duplex setae; empodial spur one-half as long as the proximo-ventral empodial hairs; a pair of tiny but distinct setae ventrally proximad of the base of the six empodial setae (these tiny setae are easily visible on all tarsi, male and female). Posterior dorsal striations on hysterosoma as in *T. merganser* and *T. cocosinus*. Dorsal setae long, slender and tapering, longer than intervals between them. Length of body to tip of rostrum 0.53 mm.

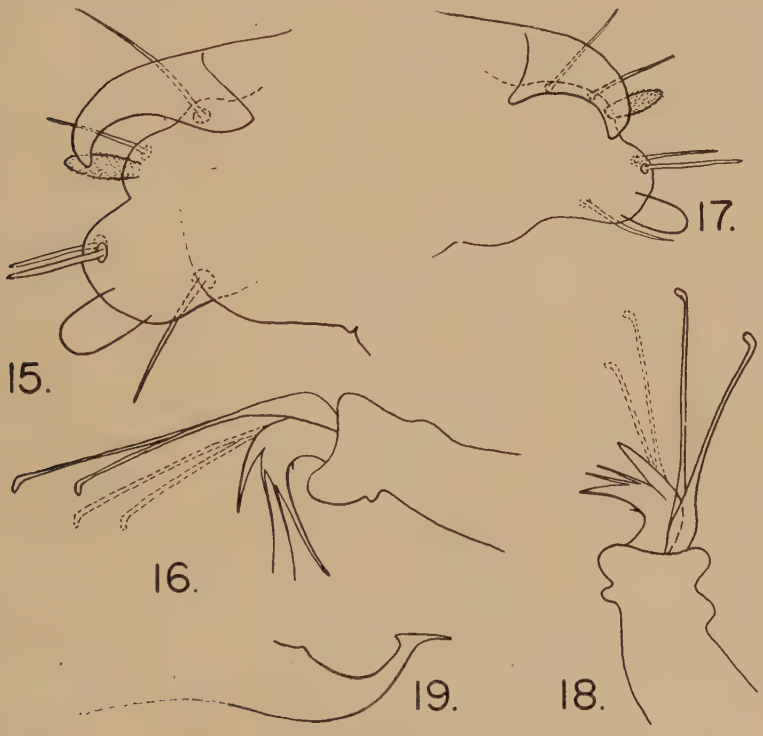


PLATE III.

Tetranychus magnoliae. Fig. 15, female, palpus; Fig. 16, female, pretarsus I; Fig. 17, male, palpus; Fig. 18, male, pretarsus I; Fig. 19, male aedeagus.

Male.—Palpus with terminal sensillum slightly longer than twice its thickness, and slightly longer than the dorsal sensillum. Tarsus I with dorsal empodial spur nearly as long as the six proximo-ventral hairs, these not fused as in most species of *Tetranychus,* but distinct and separate for most of their length, the ventral pair much thicker than the other two pairs; a pair of tiny setae near the base of the largest pair of empodial setae, as in all other tarsi. Aedeagus with external shaft emerging broadly, and tapering quickly outward as it curves upward; the distal knob with a sharp acute anterior angulation, the posterior angulation acuminate and about six times as long as the anterior point. Length of body 0.35 mm.

Holotype—Male, BATON ROUGE, LOUISIANA, August 20, 1953. (H. B. Bordreaux) on *Magnolia grandiflora;* type no. 2173 in U. S. National Museum. *Paratypes*—Nine males and seventeen females from *Magnolia* and two males and three females from *Liriodendron tulipifera,* all taken in Baton Rouge, Louisiana. In collection of the writer.

On magnolia this mite spins a profuse web on the upper surface of the leaves, near the midrib, and causes a distinct discoloration of the leaves as the colony gets older. Apparently the dense hairy lower surface of the leaves is not a suitable habitat. On the tulip tree the mites inhabit both surfaces of the leaves. Usually species of *Tetranychus* prefer the lower leaf surface, in contrast to this species. The living mites are carmine red, with paler legs and propodosoma. The eggs are unusually large, dark cream colored and spherical.

TWO NEW DIPTERAN PARASITES OF AUTOGRAPHA CALIFORNICA

Thirty specimens of *Autographa californica* Speyer, larvae and pupae, were obtained on spinach four miles west of Walla Walla, Walla Walla County, Washington, during the months of October and November, 1953. Twenty per cent parasitism by two genera of Larvaevoridae (Tachinidae) was observed. They were *Madremyia saundersii* (Will.) and *Achaetoneaura archippivora* (Will.), of which the latter is new for this particular host as far as could be ascertained. The pupation period of both these flies was observed to be approximately 16–17 days, the mean being 16.5 days.

The writer is indebted to Curtis W. Sabrosky of the United States Department of Agriculture for determining the above parasites.—DON R. SEIDEL.

NEW SPECIES OF LEPIDOSTOMA

(Trichoptera: Lepidostomatidae)

D. G. DENNING

1684 Oak Park, Walnut Creek, California

The six new species of *Lepidostoma* described herein will increase the total number of named species known to occur in the United States and Canada to about 40. Slightly over half of the described species are found only in western Canada and United States. As is usual in the *Lepidostoma* several of these new species possess some remarkable secondary sexual modifications. Unless indicated otherwise, types are deposited in the writer's collection.

PLUVIALE GROUP

One of the new species described, *errigena*, is a member of the Pluviale group. The combination of characters setting off this group from all others are described.

The Pluviale group is characterized as follows: all males have the entire costal cell reflexed, the anterior portion is very wide and the resultant pocket is lined with scales. The distribution of scales are usually heaviest along the margin of the reflexed portion. The claspers, long and slender throughout, do not terminate in an acute point; the baso-dorsal lobe originating at base of clasper is single, lacking completely a ventro-lateral lobe; this lobe is af variable size, but always digitate. The small mesal lobe present at the apex of the clasper is of variable size, but always small and acute. The aedeagus bears a dorsal pair of acuminate rods arising from near base and generally following the contour of the structure. The first antennal segment is long and slender but not particularly modified; the maxillary palpi are modified into an apparent single segment, generally small, closely appressed to the head and bearing a dense brush of scales. Legs or spurs not modified.

Characters for differentiating the species are largely confined to the tenth tergite, and is largely based on the structure of a spur arising from the lateral or apical margin.

Sexual dimorphism is most pronounced in the reflexed condition of the wing, and as Ross (1946) has pointed out, it is not limited only to this group. However, no other group has a combination of all the above characters and none possess such a wide reflexed pocket. Reflexed portions of the subcostal cell from a mere pocket to three-fourths the length of the cell occurs in several species not related to the Pluviale group.

The new species, *errigena*, will increase the members ascribed to this group to nine. When a series of several species from various sections of the country was studied it was found that a wide range of variations existed and suggest that with larger series our concept

of some of the sepcies may change. It is entirely probable that when larger series of *pluviale*, *rayneri*, *veleda*, and *ormea* are studied we will fiind that only one highly variable species is involved.

Lepidostoma errigena Denning, new species

This species, a member of the *pluvialis* group, is probably closest related to *aporna* Denning. The prominent dorsal lobe and the peculiar ventral spur will differentiate this species from others.

Male.—Length 7–8 mm. General color light brown. First antennal segment long and slender and bearing a dense brush of scales and setae along mesal margin. Maxillary palpi apparently one segmented, apex appressed against head and bearing a dense brush of dark brown scales. Front wings with entire costal cell reflexed, lined with dark brown scales.

Genitalia as in fig. 1. Tenth tergite widely separated on meson and thus divided into a pair of lateral lobes; ventral margin broadly rounded, the apico-ventral corner of ventral lobe produced into a ventrad directed spine and a caudad directed spine which may be bifid or single; dorsal spur prominent, slender and acute, reaching nearly to level of tergite; dorsal lobe not produced caudad. Clasper from lateral aspect typical of group—slender, long, basodorsal lobe digitate; from ventral aspect (fig. 1B) small acute process near apex along mesal margin. Aedeagus tubular, bearing a pair of long, closely appressed, very slender acuminate rods.

Holotype male, SEVEN OAKS, SANTA ANA RIVER, SAN BERNARDINO MTS., SAN BERNARDINO COUNTY, CALIFORNIA, July 8, 1950, John Belkin. Paratypes, two males, same data as for holotype; two males, Palomar Mt., San Diego Conuty, July 12, 1946, 4700′, C. P. Alexander. Holotype and one paratype deposited in the collection of the Academy of Science, San Francisco, California.

UNICOLOR GROUP

This group contains the largest number of described species. These species are quite variable but all possess the following characteristics. The clasper, while differing among the various species, is always short, and the baso-dorsal process is also short and usually pointed at the apex. The front wings have only a narrow reflexed area or only a small basal portion of the costal cell will be reflexed. Some of the most remarkable sexual modifications occur among the males of this group.

Lepidostoma recina Denning, new species

This species is a member of the *unicolor* group. It may be distinguished from other species by the ventral lobe of the tenth tergite.

Male.—Length 9 mm. Wings, legs and antennae light brown. Front

wings with reflexed cell wide but covering only about three-quarters of the costal cell, resultant pocket lined with brownish scales; along cubitus an infolding of the membrane produces a second distinct pocket in the wing. Maxillary palpi apparently one segmented, short and flattened, apical portion bearing a dense brush of blaskish scales. First antennal segment long and slender, no secondary modifications.

Genitalia as in fig. 2. Tenth tergite as seen from dorsal aspect (fig. 2B), separated on meson only a short distance, apices of dorsal lobe sub-triangular, along dorso-mesal portion there is present a row of short protuberances just discernable, each bearing a short seta; along lateral margin there is a series of several prominent spines each bearing a short seta; ventral lobe produced caudad beyond remainder, truncate and serrate, lateral margin sinuate. Tenth tergite from lateral aspect (fig. 2A) with ventral margin arcuate, ventro-apical lobe produced caudad into a prominent lobe, the serrate margin directed dorso-caudad; dorsal lobe broadly rounded and bearing along dorsal and apical margin a series of prominent spines and protuberances each bearing a short seta. Clasper short, apex upturned and sub-acute; baso-dorsal lobe short and digitate, lateral lobe long, slender and acute; meso-apical surface bearing a short slender acute process projecting just to apex. Aedeagus short, arcuate, bearing no accessory structures.

Holotype male, Peavine Ridge, McMinnville, Oregon, June 29, 1950, K. M. Fender.

Lepidostoma mira Denning, new species

This species belongs to the *unicolor* group with distinguishing characters confined to the tenth tergite and the peculiar first antennal segment.

Male.—Length 8 mm. Wings, legs and antennae light brown. Maxillary palpi apparently one segmented, about two and one-half times length of head, distal two-thirds covered with a dense brush of scales and setae. First antennal segment about twice length of the head, mesal margin with a digitate projection producing a distinct incision (fig. 3B); lateral and mesal margin bearing a dense brush of dark brown setae. Basal portion of costal cell of front wing folded over to form a small pocket densely lined with dark brown scales, scattered brownish scales over remainder of wing.

Genitalia as in fig. 3. Dorsal lobes of tenth tergite, from dorsal aspect (fig. 3C) emarginate; ventral lobe projecting caudad and sub-acute apically. Tenth tergite from lateral aspect (fig. 3A) with a prominent quadrate spur along lateral surface of dorsal lobe, consisting of a dorsad and caudad directed apex; ventral lobe produced caudad beyond remainder, bearing a large spur near base of lobe and a small spur toward apex. Claspers short, constricted distally to a dorsad directed bifid apex; baso-dorsal lobe fairly slender, lateral lobe closely appressed to dorsal margin of clasper, slender and finger-like. Aedeagus bearing a pair of acuminate rods widely separated and closely appressed to structure.

Female.—Length 8 mm. Color, size and general structure same as for male. First antennal segment long, about two and one-half times length of head. Spermatheca as in fig. 3D.

Holotype male, STRAWBERRY, TUOLUMNE COUNTY, CALIFORNIA, July 8, 1951, E. L. Silver. *Allotype* female, same data as for holotype. Paratype males, 1 male, same data as for holotype; 1 male, Castle Lake, Siskiyou County, California, Harry Chandler. Holotype deposited in the collection of the University of California, Berkeley, California.

Lepidostoma spicata Denning, new species

This species is a member of the *unicolor* group. It may be distinguished from other Lepidostoma by the tenth tergite and the peculiar first and second segments of the antennae.

Male.—Length 9 mm. General color of wings, legs, antennae and body light brown. First antennal segment very large and bulbous, somewhat quadrate, posterio-mesal portion somewhat flap-like with each segment approximate; second antennal segment (fig. 4C) with a flattened mesad directed arcuate process, the inner surface of semi-circle thus formed densely lined with short blackish setae. Maxillary palpi apparently one segmented, projected above head, apices flattened, mesal surface grooved and convergent, lateral and ventral margins clothed with long brownish setae.

Genitalia as in fig. 4. From dorsal aspect, tenth tergite (fig. 4B) emarginate, resultant dorsal lobes bearing several small spines distally; ventral lobe occupies most of tergite and very spinous. Tenth tergite from lateral aspect (fig. 4A) with dorso-distal corner of dorsal lobe bearing several small spines; ventral lobe with ventro-distal corner broadly rounded and spinous. From lateral view entire distal portion of tenth tergite appears covered with spines of variable shapes and sizes. Claspers extend beyond tenth tergite only a short distance, apex sub-truncate, baso-dorsal lobe short, digitate; lateral lobe longer, slender and parallel to clasper. Aedeagus tubular, apex sub-membraneous and bearing a pair of very large acuminate rods, shorter than aedeagus; large size and shape unusual for this group.

Holotype male, TWIN CREEK CAMP, BITTEROOT MOUNTAINS, SALMON, IDAHO, 5000′ elevation, July 25, 1952, Borys Malkin. Paratype male, same data as for holotype.

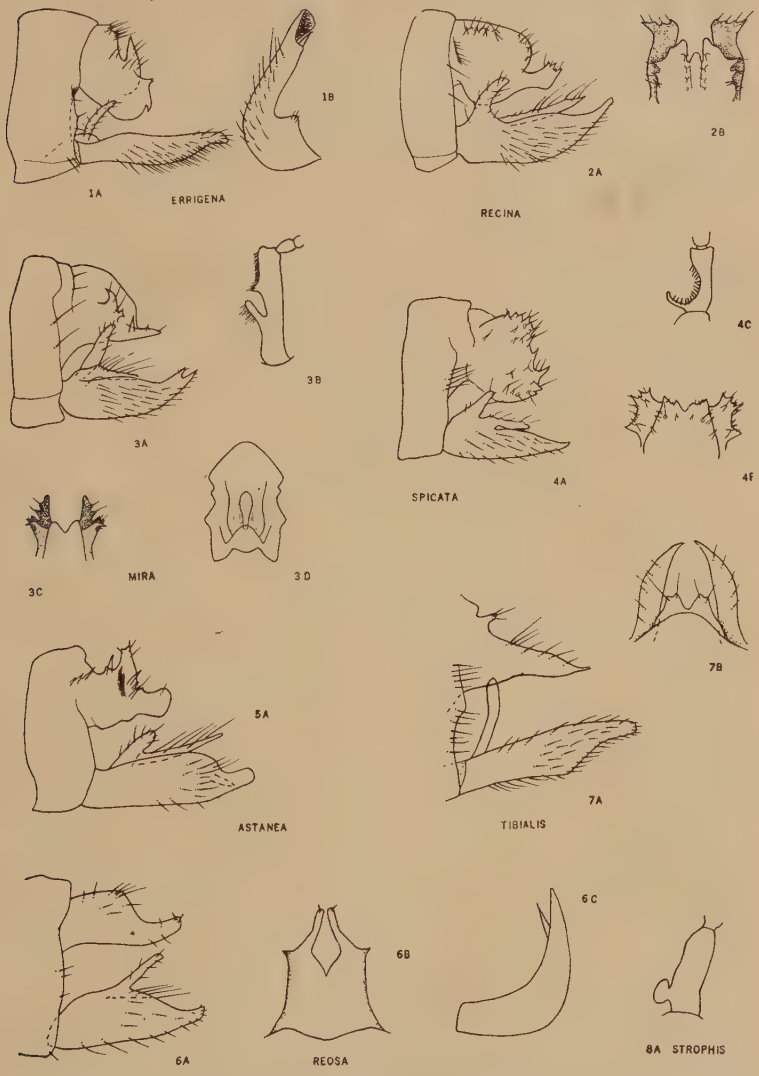
Lepidostoma astanea Denning, new species

This species is a member of the *unicolor* group. Distinguishing characters are present in the tenth tergite with its prominent dorsal spine and elongated ventral lobe.

Male.—Length 7 mm. First antennal segment long and slender, otherwise not modified. Maxillary palpi apparently two segmented, directed dorsad to near margin of head, mesal surface bearing a dense brush of blackish scales and setae. About three-quarters of the costal cell of the front wing

EXPLANATION OF FIGURES

Fig. 1. *Lepidostoma errigena*, male genitalia; 1A, lateral aspect; 1B, clasper, ventral aspect. Fig. 2. *Lepidostoma recina*, male genitalia; 2A, lateral



aspect; 2B, tenth tergite, dorsal aspect. Fig. 3. *Lepidostoma mira,* male and female genitalia; 3A, lateral aspect; 3B, basal segment antenna; 3C, tenth tergite dorsal aspect; 3D, spermatheca. Fig. 4. *Lepidostoma spicata,* male genitalia; 4A, lateral aspect; 4B, tenth tergite, dorsal aspect; 4C, second segment antenna. Fig. 5. *Lepidostoma astanea,* male genitalia; 5A, lateral aspect. Fig. 6. *Lepidostoma reosa,* male genitalia; 6A, lateral aspect; 6B, tenth tergite, dorsal aspect; 6C, clasper, ventral aspect. Fig. 7. *Lepidostoma tibialis,* male genitalia; 7A, lateral aspect; 7B, tenth tergite, dorsal aspect. Fig. 8. *Lepidostoma strophis;* basal segment antenna.

reflexed although resultant pocket is not wide, pocket filled with blackish scales. Spurs 2–4–4.

Genitalia as in fig. 5. Ninth segment annular, where it merges into tenth tergite there is a cluster of small spines. Tenth tergite from dorsal aspect with short emargination. From lateral aspect tenth tergite (fig. 5A) with apico-dorsal corner produced into an acute prominent dorsad directed spur, at base of which there is a cluster of spines which are very prominent from either dorsal or ventral view; ventral lobe produced caudad as a large obtuse process. Clasper slender throughout, abruptly constricted distally into a truncate apex; baso-dorsal lobe short, about one-third length of lateral lobe which is slender, acute and reaches nearly to apex of clasper; short, slender mesal process present near apex. Aedeagus with no accessory structures.

Holotype male, PATRICK CREEK, DEL NORTE COUNTY, CALIFORNIA, June 24, 1951, D. G. Denning.

TOGATUM GROUP

Lepidostoma reosa Denning, new species

This species is a member of the *togatum* group in which the tenth tergite is produced caudad into a pair of lateral arms. In this species, *reosa*, the claspers are not elongate as in *togatum*, *knowltoni*, *tibialis* and *carolina*, the only members of this group. Another character which quickly separates *reosa* is the dorsad curving rather than ventrad of the tenth tergite lateral arms.

Male.—Length 5 mm. General color brownish. Maxillary palpi apparently one segmented and erect. Wings, legs and antennae with no particular modifications.

Genitalia as in fig. 6. Tenth tergite, from lateral aspect, (fig. 6A) with dorsal margin arcuate; ventral lobe extended caudad as a slender dorsad-directed arm, apex obtuse and bearing two small spines. Tenth tergite, from dorsal aspect (fig. 6B) separated on meson nearly half the distance, the two lateral arms gradually convergent but not confluent; approximately midway, lateral margin produced into an acute angulation. Claspers short and robust, apex truncate; baso-dorsal process slender and directed dorso-caudad; from ventral aspect (fig. 6C) no basal angulation, near apex a short acute mesal process. Aedeagus with no accessory structures.

Holotype male, BELCHERTOWN, MASSACHUSETTS, May 21, 1938, (from University of Massachusetts Collection).

LEPIDOSTOMA TIBIALIS (Carpenter)

1947 *Lepidostoma rileyi Denning*, Ent. News, LVIII, No. 10:257 figs. 9, 10 (New synonymy).

Distinguishing characters are in the tenth tergite; the dorsal lobe is very short while the ventral lobe is produced caudad into a heavily sclerotized acute process, as seen from either the lateral aspect (fig. 7A) or dorsal aspect (fig. 7B). The species has been recorded only from North Carolina, Georgia and Tennessee.

Several collections of Trichoptera have yielded some very interesting distributional data of some species of *Lepidostoma*. They are as follows:

Lepidostoma cascadensis Milne.—This is a typically Western species. The following records extend the known range northward.

Yukon Territory: Alaska Highway, Mile Post 632, June 28, 1952, C. P. Alexander.

Alberta: Jasper, June 16, 1952, C. P. Alexander.

Lepidostoma cantha Ross.—Previously known only from Monterey and Contra Costa Counties, California. The present record extends the distribution to the southern part of the state.

California: Topanga Canyon, Los Angeles County, May 30, 1952, John Belkin; Pinnacles National Monument, Monterey Co., May 3, 1946, H. P. Chandler.

Lepidostoma frosti Milne.—Known distribution in the Northeast; New Hampshire, Massachusetts, Quebec and now Nova Scotia.

Nova Scotia: Cape Breton, Lake Bras D'or, July 4, 1951, C. P. Alexander.

Lepidostoma hoodi Ross.—Previously known only from Mt. Hood, Oregon and Nanaimo, B. C.

Washington: Mt. Rainier, Aug. 4, 1952, Vincent Roth.

Lepidostoma ontario Ross.—Eastern in distribution: Ontario, New Hampshire and Maine.

Nova Scotia; Cape Breton, Victoria Co., July 1, 1951, C. P. Alexander.

Lepidostoma podager (McL.).—Definite records have been available only from California. The following record extends the species into the Rocky Mountain area.

Wyoming: Madison Jct., Yellowstone Natl. Park, July 6, 1946, Marion E. Smith.

Lepidostoma quercina Ross.—Until now recorded only from Oregon and Idaho.

Washington: Kuschi Creek, near Goldendale, May 29, 1952, D. G. Denning.

Lepidostoma querla Denning.—Previously record only from type locality, Oak Creek Canyon, Arizona.

Arizona: Diamond Creek, White Mts., June 20, 1950, R. H. Beamer.

Lepidostoma roafi (Milne).—Well distributed in the western half of the country. The following are new northern records.

Yukon Territory: Alaska Highway, Mile Post 632, June 28, 1952, C. P. Alexander. Alberta: Banff, Aug. 14, 1949, C. P. Alexander.

Lepidostoma swannanoa Ross.—Eastern in distribution: New Hampshire, New York, North Carolina and now Massachusetts.

Massachusetts: Amherst, June 9, 1941, Marion E. Smith.

Lepidostoma strophis Ross.—Transcontinental and well dis-

tributed through the West, but unrecorded from Idaho. The first antennal segment, with the peculiar knob along the mesal surface near the base of the segment, is illustrated in fig. 8A.

Idaho: Lewiston, May 25, 1952, D. G. Denning.

Lepidostoma togatum (Hagen).—Distributed through the eastern half of the country. The Alberta record extends the known range northwestward.

Alberta: Wahamum, July 13, 1939, E. H. Strickland. Nova Scotia: Halifax Co., near Ecum Secum, June 29, 1951, C. P. Alexander; Inverness Co., Margaree River, July 3, 1951, C. P. Alexander.

Lepidostoma unicolor (Banks).—Widely distributed from Minnesota to the Pacific Coast and northward into Saskatchewan. Now known to occur in the Southwest.

Arizona: Big Creek, Graham Mts., Graham County, Aug. 19, 1952, Hugh Leech. California: Tanbark Flats, Los Angeles County, July 2, 10, 26, 1952, A. T. McClay.

ANOTHER WEEVIL INJURIOUS TO STRAWBERRIES

On July 11 of 1953 the author was called to examine a field of strawberries near Hillsboro, Oregon, that had been severely injured by weevil larvae. The larvae had eaten into the crowns of the plants and killed many of them. The injury was so severe that the grower later plowed up the field. This weevil may become quite injurious if it spreads to other strawberry growing districts. Adult weevils were found feeding on the edges of the leaves and resting under the foliage. They were identified by Miss Rose E. Warner of the National Museum as *Peritelinus oregonus* Van Dyke. In a personal letter, C. F. W. Muesbeck stated that *P. oregonus* had been taken on filbert leaves in Oregon and on *Achillea lanulosa*. This is the first time it has been recorded on strawberries.

The original description by Van Dyke[1] states that the type series was collected on oak, *Quercus Garryana* at Corvallis on June 3, 1914. He also mentioned specimens from Klamath Falls, Oregon, collected on July 9, 1934. There are other Oregon records from Salem, Dallas and Alsea Mountain. The seasonal dates of collection of the adults range from April 27 to July 11.—R. G. Rosenstiel, *Oregon State College, Corvallis.*

[1] Van Dyke, Edwin C. 1936. New species of North American weevils in the family Curculionidae, subfamily Brachyrhininae, V. Pan-Pacific Entomologist, 12 (1) : 19-32.

NOTES ON ENDEODES LECONTE WITH A DESCRIPTION OF A NEW SPECIES FROM BAJA CALIFORNIA

(Coleoptera: Malachiidae)

IAN MOORE
El Cajon, California

In this paper, a new species of *Endeodes* is described from Baja, California, Mexico; one previously described species is treated as a synonym, and some notes on habitat and extensions of range are recorded.

The genus *Endeodes* is known only from the marine littoral of the Pacific Coast of North America. Two of the species of the genus *(basalis* and *blaisdelli)* are found abundantly only south of Point Conception, California, and have several characteristics in common which they do not share with the three more northern species. The two southern species are found from May to November, almost exclusively under debris, largely dried seaweed, just within the reach of the highest tides on the sandy beaches in association with the much more abundant *Phyconomus marinus* (LeConte) and *Epantus obscurus* (LeConte). In each of the southern species the elytra are at least twice as long as wide, so that they normally cover part of the abdomen. In the three more northern species, the elytra are very much shorter, each elytron being very little longer than wide, so that it does not extend over the abdomen.

I have found two of the latter species *(insularis* and *rugiceps)* in September and October, largely in association with *Thallasotrechus* in cracks in the rocks which were exposed at low tide. Extensive collecting on the sandy beaches uncovered a few specimens of *collaris* on one occasion under a sheet of galvanized iron and, although *Epantis obscurus* (LeConte) and *Phyconomus marinus* (LeConte) were both common in this area, I was unable to find *Endeodes* associated with them. Blackwelder (1932) states that his specimens were taken largely under driftwood.

Blackwelder's excellent revision of the genus (Pan-Pac. Ent., VIII, p. 128, 1932) is sufficient for easy identification of the previously known species, but a new key is presented here to include the new species which cannot be incorporated with his key.

A KEY TO THE SPECIES OF ENDEODES LECONTE

1. Each elytron at least twice as long as wide 2
   Each elytron not much longer than wide 3
2. Elytra concolorous, ferruginous . . . . . *blaisdelli*
   Elytra of bicolorous, ferruginous basally and black apically . . *basalis*
3. Legs, antennae, and mouthparts darker than thorax 4
   Legs, antennae, and mouthparts pale . . . . . *insularis*
4. Head black . . . . . *collaris*
   Head reddish . . . . . *rugiceps*

The following notes record some new localities and extensions of range for some of the species.

Endeodes blaisdelli Moore, new species

Color ferruginous; abdomen, eyes and tips of mandibles black. *Head* about as long as broad, covered with a fine, pale, sparse pubescence. Eyes with a few very short hairs between the facets. Labrum and clypeus slightly paler than head. *Pronotum* a little broader than long, widest at about the apical third, considerably narrowed at base, sides rather evenly arcuate, pubescence as on head. *Elytra* concolorous, pale ferruginous throughout, somewhat translucent, the dark color of the abdomen showing through the posterior fourth. Each elytron about twice as long as wide, only slightly expanded apically, conjointly nearly forming a square, sutural margins meeting for their entire length, apical margins nearly straight and truncate at right angles to the sutural margins with narrowly rounded internal angles and broadly rounded external angles. Elytra clothed in a fine sparse pubescence with a few scattered erect setae. *Legs* entirely ferruginous except for the black comb of setae on the second segment of the front tarsi in the male. Tibiae covered with short setae which are denser on apical half of middle tibiae. *Abdomen* shining black, a little lighter beneath, with a very fine, sparse pubescence which is a little longer below than above. Length 4.5 mm.

Male with second tarsal segment of anterior tarsus expanded over third, terminating in a comb of stout, dense, black setae.

Female with anterior tarsus simple.

Holotype (Calif. Acad. Sci.) male, from COLONIA GUERRERA BAJA CALIFORNIA, MEXICO, August 19, 1950. *Allotype* (Calif. Acad. Sci.) female, same data as holotype. *Paratypes* sixty-seven specimens from Colonia Guerrera, Baja California, Mexico, August 19, 1950, and one specimen from the same locality, May 28, 1950. Two paratypes have been deposited in each of the following collections: U. S. National Museum, Washington, D. C.; Museum of Comparative Zoölogy, Cambridge, Mass.; American Museum of Natural History, New York City; Chicago Natural History Museum; Canadian National Collection, Ottawa; British Museum, London; Collection of Dr. R. E. Blackwelder, Washington, D. C.; San Diego Natural History Museum, San Diego, Calif. Ten para-

types are in the collection of the California Academy of Sciences, San Francisco, and the remainder in my own collection.

The sixty-nine specimens collected on August 19, 1950, including the holotype and allotype, were taken from one very limited section of beach under small patches of dry seaweed, mostly rockgrass mixed with some kelp. The beach here is backed up by high sand dunes extending south from the mouth of the Santo Domingo River and gradually diminishing in size to near the salt marshes north of San Quintin Bay. In about the middle of this area, where the beach was slightly arched to seaward, a very high tide had cut away the sand, leaving a bank about a foot high and a thousand yards long. All the specimens were found within a belt about two feet wide to seaward of this undercut, and were more or less regularly scattered along its entire length. The beach, for its entire length, in a belt about twenty feet above and ten feet below the populated strip, was covered with similar patches of seaweed; however, not a single specimen was found elsewhere after several hours of careful searching.

This species is most nearly related to *basalis* by the length of the elytra, but can be distinguished from it at once by the concolorous elytra. It also differs from that species in the shape of the elytra, which are strongly truncate and more nearly rectangular. There is almost no variation in color in my entire series, and very little variation in the shape of the elytra and the shape of the pronotum.

This species is named for the late Dr. Frank E. Blaisdell, whose unlimited generosity with his own time was so helpful to me and to many others.

ENDEODES BASALIS (LeConte)

I am unable to draw a line of distinction between *basalis* and *abdominalis* in regard to the color of the abdomen or the shape of either the pronotum or the elytra, and I can find no other consistent difference to separate them. In my series of 245 specimens, there are twenty-two with the abdomen either entirely yellow or entirely ferruginous, and forty-four with it entirely black. The remaining 181 specimens display every gradation of color between the two extremes. Over 100 of these have the abdomen largely reddish with several small to large patches of black; and a few specimens have the abdomen largely black with indistinct orange patches. Some specimens have light smoky or dark smoky abdomens. In a small series of specimens collected at La Jolla, California, the abdomen

is a clear yellow rather than ferruginous; and the clypeus and labrum are opaque cream color in contrast to the translucent ferruginous color of these parts in specimens of a more reddish cast. However, there are specimens which seem to be intermediate between these and the rest of the series; and they appear to possess no other consistent characters for their separation. Variations in the shapes of the elytra and pronotum are just as great as those of color, and show no correlation with each other or with the variations of color of the abdomen. I can only assume that they are color variations of a single species.

Previously known from San Luis Obispo County to San Diego County, California. I have collected a large series of all color varieties except pure yellow, from Halfway House, Descanso Bay, Baja California, Mexico, in July and August; and four specimens of both black and mixed colors from Sausal, Baja California, Mexico, in July. A series of specimens showing the range of variation has been deposited in the entomological collections of the California Academy of Sciences, San Francisco.

ENDEODES INSULARIS Blackwelder

Previously known from San Miguel Island and the adjacent Prince Island, California. I collected three specimens at Gaviota State Park, Santa Barbara County, California, in October. The islands are almost due south and nearly opposite this part of the mainland. My specimens were taken in company with *Thallasotrechus nigripennis* Van Dyke from cracks in a tilted sedimentary sandstone formation which was exposed by the low tide. They were found below the mean high water mark.

ENDEODES COLLARIS (LeConte)

Known from Vancouver Island, British Columbia, south to Monterey County, California. I have taken it in October from cracks in the rocks below mean high tide in association with *Thallasotrechus nigripennis* Van Dyke and *Liparocephalus* at Moss Beach, San Mateo County, California; and from beneath a sheet of galvanized iron on the sandy beach above the high water mark at Santa Cruz, California, in October.

I am indebted to Mr. Hugh B. Leech of the California Academy of Sciences for the loan of specimens and for many other favors, and to the late Dr. Edwin C. Van Dyke for many helpful suggestions in both the laboratory and the field.

A POLYTYPIC INTERPRETATION OF THE CALIFORNIA CARPENTER BEE XYLOCOPA CALIFORNICA WITH THE DESCRIPTION OF A NEW SUBSPECIES AND NOTES ON A POSSIBLE POLYTOPIC FORM

(Hymenoptera: Apoidea)

PAUL D. HURD, JR.
University of California, Berkeley

In the course of preparing a review of the Carpenter bees of California[1] a new subspecies of *Xylocopa californica* has been recognized in the material originating from the mountainous regions of cismontane southern California.

Cresson (1864) characterized as a new species *Xylocopa californica* from Fort Crook, California, and *Xylocopa arizonensis* from Arizona. Cockerell (1904) remarked that he could find no valid structural characters separating these two forms and regarded them as subspecies. *X. californica arizonensis*, according to Cockerell, occurred from Los Angeles, California, eastward to New Mexico and southward to San José de Guaymas, Mexico; *californica* proper was restricted to northern California.

Ackerman (1916:230) states in his revision of the Nearctic species that *californica* and *arizonensis* are specifically distinct. This author mentions that he noted a difference in the genitalia of the two forms and further remarked that he found differences in coloration and in the expression of pale pilosity on the abdomen. He gives the geographic range of *californica* as California, Nevada, Colorado and South Dakota and that of *arizonensis* as Arizona, New Mexico, Lower California, Texas, and Mexico. In the recent Synoptic Catalog of Hymenoptera of America north of Mexico Michener (1951) has accorded *californica* and *arizonensis* subspecific status listing *californica arizonensis* from Texas, New Mexico, Arizona, California, Mexico (deserts) and *californica* proper from South Dakota, Colorado, Nevada, Arizona and California.

The present writer has made a critical morphological study of this complex and has been unable to demonstrate any structural character, apart from color and the amounts of pale pilosity, which

[1] The Carpenter Bees of California, Bull. Calif. Insect Survey (in manuscript).

could be used to regard these forms as separate species. Moreover, a geographical analysis of the distribution of these forms clearly indicates they are geographic segregates (see map).

On the basis of coloration, *Xylocopa californica* contains three readily recognizable subspecies, which geographically replace one another. Each subspecies uses different softwoods in which to nest. The subspecies *californica* proper nests in redwood and incense cedar; *diamesa* nests principally in *Yucca whipplei;* and *arizonensis* uses various desert agaves and yuccas. From the high mountain localities in southern California (San Bernardino and San Jacinto Mountains) several specimens are available which are phenotypically very much like *californica* proper and suggest the possibility of a high mountain population which is using the isolated stands of incense cedar in which to nest. If this is the case it is possible that these bees are either of polytopic origin, having been derived from the yucca-using *diamesa*, or may be isolates of *californica* proper which have remained associated with these now isolated stands of incense cedar. It is significant, however, that the available specimens from these high mountain southern California localities are not phenotypically equivalent to the Sierran populations of *californica* proper. A critical field study of these isolates is needed before an understanding of origin and relationships can be achieved.

The three subspecies concerned may be separated by the following key.

KEY TO THE SUBSPECIES OF XYLOCOPA CALIFORNICA Cresson

1. Males 2
   Females 4

2(1) Abdomen predominantly blue in color; fourth metasomal tergum without a medially interrupted fringe of whitish hairs 3
   Abdomen predominantly green in color; fourth metasomal tergum with a medially interrupted fringe of whitish hairs. North coast and Sierra Nevada Mountains of California and southern Cascade Mountains of Oregon ..... *californica*

3(2) Wings heavily infuscated with black and strongly violaceous; abdomen dark blue. Deserts of California, Arizona, Nevada, New Mexico, Utah, Texas and Mexico ..... *arizonensis*
   Wings paler, not heavily infuscated with black, less strongly violaceous; abdomen blue, often blue with traces of green. Mountains of cismontane southern California northward to Monterey County..... *diamesa*

4(1) Abdomen predominantly blue 5
Abdomen predominantly green. North coast and Sierra Nevada Mountains of California and southern Cascade Mountains of Oregon ..... *californica*

5(4) Wings heavily infuscated with black and strongly violaceous; abdomen dark blue. Deserts of California, Arizona, Nevada, New Mexico, Utah, Texas and Mexico ..... *arizonensis*
Wings paler, not heavily infuscated with black, less strongly violaceous; abdomen blue, often blue with traces of green. Mountains of cismontane southern California northward to Monterey County ..... *diamesa*

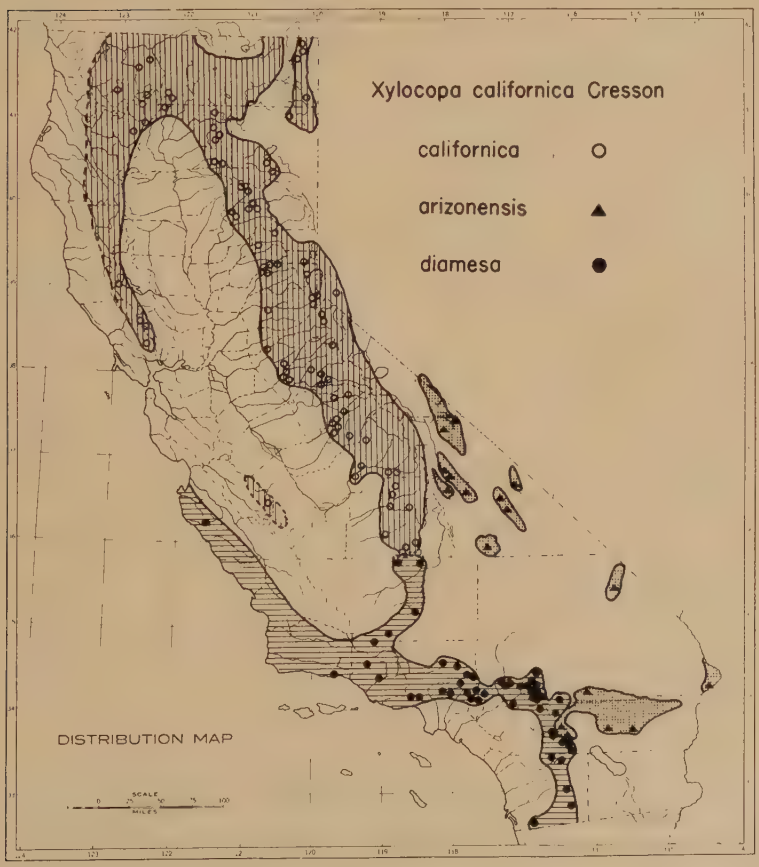


Fig. 1. — Distribution of *Xylocopa californica* Cresson within California.

Xylocopa californica diamesa Hurd, new subspecies

Diagnostic characters. — *Male.* Head, body, and legs blue, sometimes with green reflections. Wings infuscated with black, violaceous, but much less intense than in *arizonensis*, but darker than in *californica* proper. Abdomen without a fringe of pale hairs on fourth metasomal tergum. *Female.* Similar to male, but wings somewhat darker.

Holotype male, *allotype* female, and one paratype female from Crystal Lake, San Gabriel Mountains, Los Angeles County, California, July 9, 1952, collected by Joan Linsley. Additional paratypes are from the type locality, on June 29, 1950 (W. C. Bentinck, A. T. MacClay, J. W. MacSwain, M. J. Stebbins, and H. N. Yokoyama), on July 9, 1952, (R. L. Anderson, R. M. Bohart, E. M. Evans, A. Gregarick, H. L. Mathis, A. T. McClay, S. Miyagawa and J. H. Nakata), and on July 7, 1934, (C. D. Michener). Other paratypes are from Camp Baldy, San Gabriel Mountains, Los Angeles County, California, July 4, 1928, (F. B. Foley), on June 26, 1950, flowers *Fremontia* (P. D. Hurd, Jr.), on July 11, 1950, (H. L. Hansen, P. D. Hurd, Jr., J. D. Paschke), and on July 7, 1952, (A. R. Maggenti). One additional paratype is from Tanbark Flat, San Dimas Experimental Forest, San Gabriel Mountains, Los Angeles County, California, July 3, 1950, (H. M. Graham). The holotype and allotype are on deposit in the California Academy of Sciences.

As the name *diamesa* suggests this subspecies is intermediate in its character between *californica* proper and *arizonensis*. Geographically it occupies an intervening area betwen the aforementioned subspecies.

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MORPHOLOGICAL DESCRIPTION OF THE LARVA OF OREOPASITES VANDUZEEI COCKERELL

(Hymenoptera: Anthophoridae)

JEROME G. ROZEN, JR.[1]
University of California, Berkeley

This paper represents the first description of the larva of a member of the Ammobatini, a tribe composed entirely of parasitic bees. *Oreopasites*, the only New World genus belonging to this tribe, is parasitic on the panurgine bees of the genus *Nomadopsis* Ashmead.

The specimens upon which this paper is based were recovered from the cells of *Nomadopsis anthidius* (Fowler), a large species, which gathers pollen from various species of *Trifolium*. The identification of the parasitic bee larvae was made by inference from the great number of large-sized *Oreopasites vanduzeei* Cockerell, which were found at the nesting site of the host bee.

Three of the parasitic larvae were exhumed and preserved. One is a large-sized, yellowish specimen, which, on the basis of the author's experience with other bee larvae, is obviously the hibernating form. One, slightly larger, is whitish and is the fully-grown larva which has not yet defecated and assumed the hibernating appearance. In lieu of a more appropriate name for this form, it will be called the "white larva" because of its color, although body form is just as striking a difference between it and the hibernating one. The third larva is the first instar.

In the description of these three larvae, the morphological terms and the study techniques which were employed by Michener (1953) have been adopted for the most part.

Because Michener *(ibid.)* in his comprehensive study of bee larvae was not fully able to discern between hibernating and prehibernating larval forms, it is perhaps worth-while to describe and to discuss the differences between them for this species. These dissimilarities are apparently due to several reasons, one of the main ones being the elimination of the fecal material by the larva as it enters the hibernating stage. The material consists of the undigestable portion of all the pollen which the individual has consumed during the larval stage. The defecation of such a large quantity undoubtedly causes the very marked difference between the body

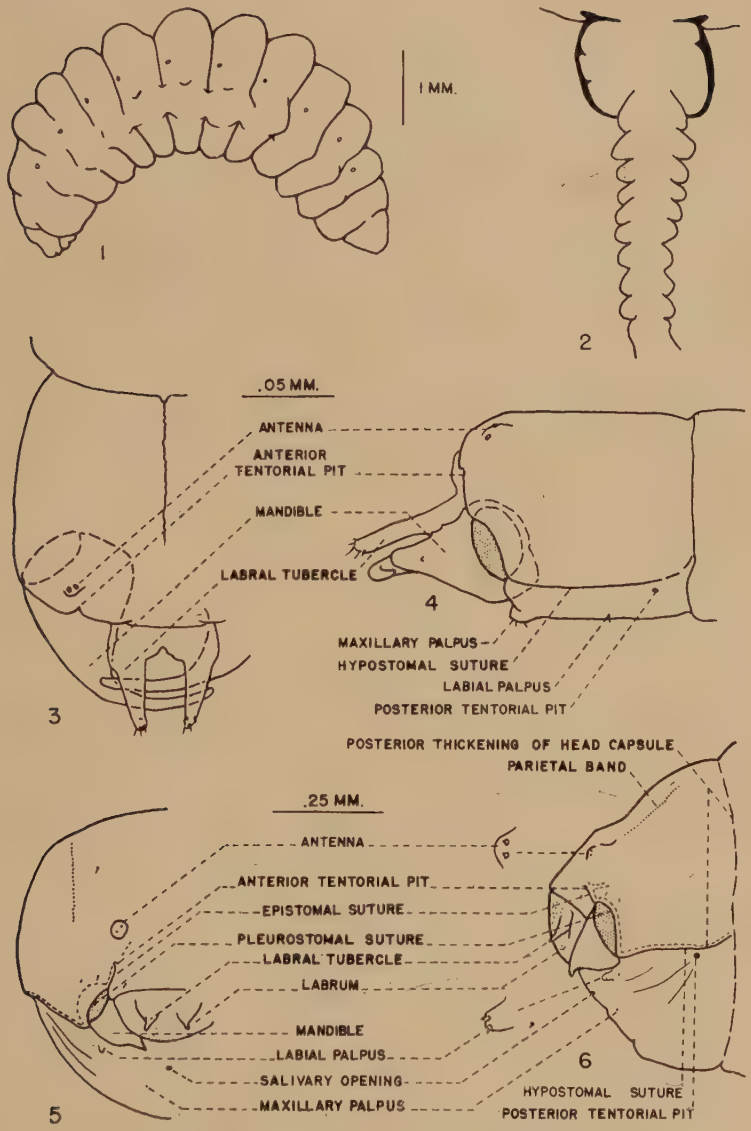
[1] The author wishes to express his thanks to Dr. E. Gorton Linsley, who very kindly read the manuscript.

shape of the two larvae, and may account for the "white larva's" having a smooth integument while the hibernating form has a finely wrinkled one. Other differences between these two are probably associated with physiological changes in the organism as it enters diapause and prepares to withstand the adverse winter weather conditions.

The following is a summarization of the differences between these two larvae. In the "white larva" the head capsule is in general less sclerotized, as is evidenced by its comparative lack of rigidity and lighter coloration. The hibernating larva has several folds (figs. 5 and 6) on the lateral portions of the labiomaxillary region, which may be mistaken for a suture separating the two component mouthparts. Such folds are absent in the "white larva," so that it is assumed that these folds are superficial, being due to the reduction of the body content after defecation. As is stated above, the body integument of the "white larva" is smooth, whereas that of the hibernating form is finely wrinkled. In color the "white larva" is translucent white and not opaque with a yellowish hue as is the hibernating one. Intersegmental lines are very shallow in the "white larva," while they are deeply incised in the other. The "white larva" is subcircular; the hibernating form, seen in cross-section through the apices of the dorsolateral tubercles, is strongly dorsoventrally compressed, so that the body at its largest diameter is nearly twice as wide as high. The shape of the dorsolateral tubercles differs between the two forms; this dissimilarity is discussed in the description of the larva. The main differences between the two larval forms are those listed above. In all other major respects the larvae are identical and are described together below as the mature larva.

Description of Mature Larva

Head: Capsule with integument very lightly sclerotized, bearing few scattered setae. Anterior and posterior tentorial arms very short in both hibernating and "white" larvae; remaining portion of tentorium absent. Posterior tentorial pits situated slightly below hypostomal thickening. Posterior thickening of head capsule, except near connection to hypostomal thickening, very faint, so that boundary between head and body difficult to distinguish; near hypostomal suture posterior thickening pronounced, though somewhat less so than hypostomal thickening, and running in the same direction as, and as a continuation of, hypostomal thickening. Hypostomal thickening and corresponding suture pronounced. Pleurostomal thickening pronounced. Epistomal thickening and corresponding suture between precoilae and anterior tentorial pits weak, though evident; epistomal thickening between



EXPLANATION OF FIGURES

Oreopasites vanduzeei Cockerell

Fig. 1, hibernating larva, lateral view; fig. 2, spiracle; fig. 3, first instar, dorsal view of head; fig. 4, first instar, lateral view of head; fig. 5, hibernating larva, front view of head; fig. 6, hibernating larva, lateral view of head.

anterior tentorial pits obscure, perhaps extending upward and running immediately mesad of each antenna; epistomal suture absent. Antennae low convexities. Parietal bands faint, clearly seen only on cleared head capsule. Labrum protruding (in drawn specimen labrum has been somewhat flattened and tubercles abnormally directed ventrad instead of anteriad as in "white larva"); integument with minute spicule-like projections and apically with scattered sensilla; labral tubercles long, attenuate. Hypopharynx united with surrounding maxillae and labium so as to be difficult to definitely delineate, except perhaps for shallow, unsclerotized groove in approximate position of hypopharyngeal groove; integument without spicules or sensilla. Salivary opening circular, not labiate, and situated somewhat below supposed hypopharyngeal groove. Mandibles at base stout; at apex pointed, curved inward, and with upper and lower margin coarsely serrate; mandibles nearly identical to those of *Nomada fowleri* Cockerell as drawn by Michener (1953:1069) except dentition on cusp lacking. Maxillae so fused with surrounding mouthparts as to be impossible to delineate, though evident apically as slight, palpus-bearing convexities, which are weakly sclerotized in overwintering larva, and which lie immediately below mandibles; palpi small but distinct, each bearing two apical sensilla; each maxilla with single sensillum laterad of palpus. Labium exceeded by hypopharynx, not divided into prementum and postmentum; palpi completely lost except apparently for two sensilla, each of which is in approximate position of palpus.

Body: Integument minutely spiculate. Intrasegmental lines absent. Dorsolateral tubercles in "white larva" very low, scarcely noticeable toward posterior end of abdomen; in hibernating larva apex of tubercles as high as elevation of body at median line, so that body surface, between apices of tubercles on same segment, straight. Spiracular atrium protruding above body wall, with rim, and with rows of small teeth on inner surface; peritreme flat or perhaps slightly concave.

It may be of some interest to note that of the three spiracles of mature larvae to be examined, one, that of the hibernating larva, contained in the atrium a single pollen grain of *Trifolium* and the two from the "white larva" contained in their atria three and four pollen grains. While the atrial opening is large enough to allow the pollen grains to enter, the collar of the primary tracheal opening is sufficiently small to exclude the grains from entering the subatrium.

On the basis of the morphology of the mature larva, *Oreopasites* seems to fall well within the *Neopasites-Nomada*-Epeolini group, a group which, though appearing unrelated in adult characteristics, has larvae which are very similar to one another as reported by Michener (1953). The larva of *Oreopasites* shares with this group the following characters which are listed by Michener (1953:1066) for the group: salivary opening reduced, without lips; antennal papillae reduced; mandibles acute at apices. Within

this group of parasitis bees, *Oreopasites* seems to be most similar to *Nomada* as is shown by the following list of characters which the two genera hold in common: head capsule weakly sclerotized, broadly attached to body; posterior thickening of head capsule weak; tentorial pits weak; mandibular shape and dentition (except on cusp); labiomaxillary region reduced; spiracular shape; and over-all body shape.

Oreopasites differs from the above mentioned group in the peculiar position of the posterior tentorial pits; the unspiculate hypopharynx; the lack of dentition on the mandibular cusp (also lacking in the Epeolini), though the mandible is otherwise identical with that of *Nomada;* in the apparently even more reduced labiomaxillary region, including the near loss of the labial palpi; and from *Nomada* and *Neopasites* in the presence of atrial spines which, moreover, are quite different from those of the Epeolini.

While the morphology of the mature larva of *Oreopasites* is of particular interest because of the light it throws on the phylogenetic relationships of the genus (and the tribe) to other groups, the morphology of the first instar is of interest because of the adaptation of the first instar for killing the egg or perhaps young larva of the host bee.

The first instar is markedly different from the mature larva. Unfortunately, a complete description of the first instar is impossible because of the specimen's extremely small size (length 1.1 mm.) and because the specimen was about to molt, so that portions of the integument of the second instar are visible and thus obscure the structures on the first instar. However, a brief description is given and the head has been drawn (figs. 3 and 4), so that at least some idea of the larva can be gained.

The head is elongate, more prognathus than that of the mature larva. The labral tubercles are very long, extending anteriad well beyond the closed mandibles. The mandibles are sickle-shaped and beset with short teeth on their inner edge. The antennae, maxillary palpi, and labial palpi have the same number of sensilla as the mature larva. The posterior tentorial pits are in the same position as in the mature larva. The post-cephalic region is slender, uncurved, and not grub-shaped.

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AN EFFICIENT METHOD OF COLLECTING DUNG BEETLES

In 1884, C. H. Roberts* recorded a method of collecting dung beetles which, with some refinements, has proved so effective that it seems worthy of recording again. The following implements are used: A pail, a circle of ¼-inch mesh wire screen of a small enough diameter to fit into the pail, to the center of which has been secured a weight (any small pipe fitting will do), a collecting jar of alcohol, a strip of fine mesh wire window screen narrow enough to insert into the collecting jar, and a five-gallon can of water. The dung is placed in the bucket with the coarse mesh screen on top to hold it down, and water added to cover. The beetles will some quickly to the surface and may be easily scooped up with the strip of window screen which is then dipped into the jar of alcohol to dislodge them. In this way, the entire population of a single dropping, sometimes hundreds of specimens, may be taken in a very few minutes. This method is not only fast but relatively clean if a spade is handy.—IAN MOORE, *El Cajon, California.*

* C. H. Roberts in "Miscellaneous Notes" Bull. Brook. Ent. Soc. 1884, VII, p. 74

BOOK NOTICE

THE COCONUT RHINOCEROS BEETLE (ORYCTES RHINOCEROS) WITH PARTICULAR REFERENCE TO THE PALAU ISLANDS. By J. Linsley Gressitt, Honolulu; Bernice P. Bishop Museum Bulletin 212 viii+157 pp., 50 figs. November 1, 1953.

The Palaus include 343 islands and islets, and form a group near the westward limits of the Caroline Islands, north of New Guinea. The destructive *Oryctes rhinoceros* (Linnaeus) is thought to have been introduced into a central island, Koror, during 1942, by Japanese shipping. Because of an abundance of war-killed palms, the beetles were able to spread and within ten years kill 50% of the palms in the Palaus. *O. rhinoceros* was introduced into the Samoan Islands over 40 years ago but has there killed only about 12% of the palms. The adults prefer mature coconut palms but will attack those of any age; they will feed on many other kinds of palms, native and introduced, as well as on *Pandanus*, sugar cane and pineapple. Larvae breed in dead trunks and stumps, compost piles, sawdust pits, and other places where there is sufficient humus.

Dr. Gressitt's paper is based on six months of study in the Palaus and one in the Samoan Islands, 1951 and 1952 (sponsored by the Pacific Science Board), plus a review of the literature. Included are illustrated discussions of the morphology, biology and ecology of *O. rhinoceros* in its various stages, damage evaluation and population studies, and biological, cultural and chemical control. There is a biblography (pp. 132-147) of 310 items, and a full index. Most of the 50 figures are compound.—HUGH B. LEECH.

A REVIEW OF THE GENUS RHIPIDOTHRIPS UZEL

(Thysanoptera: Aeolothripidae)

STANLEY F. BAILEY
University of California, Davis

This genus of thrips has been considered chiefly European. Recent findings of two species in California (Bailey and Cott, 1952) and Oregon, however, have added it to our North American fauna. Therefore, *Rhipidothrips* becomes a part of our series of reviews of the thrysanopterous genera. Since it is such a small group we have included all known species.

In addition to the species given in the key below, several other thrips have been assigned to the genus *Rhipidothrips*. The Australian species *aureus*, described by Moulton, 1935, has been studied and found to belong in a new, yet undescribed genus related to *Desmothrips*. *R. turneri* Moulton, 1930, was made the type of the new genus, *Rhipidothripiella*, by Bagnall in 1932. In turn, Bagnall's species *uzelianus* is now synonymized with *gratiosus* Uzel.

Acknowledgments are very much in order as we are indebted to H. Priesner and J. D. Hood for the loan of valuable specimens. Without this considered cooperation such reviews in the Thysanoptera are nearly impossible. In addition, we wish to thank E. S. Ross of the California Academy of Sciences for making the Moulton collection available.

Genus RHIPIDOTHRIPS Uzel, 1895

Head longer than wide, slightly produced beyond eyes, broadly attached to thorax. Compound eyes prolonged ventrally. Ocelli present. Maxillary palpi 3-segmented. Labial palpi 4-segmented. Antennae 9-segmented, the terminal three segments fused, the third long; segments III and IV with ventral clear lense-shaped sensory areas at distal position, sometimes nearly forming a band around the segment. *Pronotum* wider than long with lateral suture at each side along the long axis of the body. Bristles weak at anterior margin usually with one longer than others at each posterior lateral angle and two or more pairs along posterior margin. Fore tarsus with hook and a strong spine at distal end of fore tibiae. *Wings* broad and rounded; fore wings with typical aeolothripid veination with the exception of vestigial crossveins in the posterior portion; brachypterous forms with reduced veination (fig. 10). *Abdomen* broadly joined to thorax, tapering sharply at posterior, ovipositor up-curved. Terminal segments of male without claspers, heavy spines or chitinized projections (fig. 2).

Genotype: *Rhipidothrips gratiosus* Uzel, 1895. By monotypy. See also Priesner, 1949, p. 147.

This genus belongs in the group aeolothripini and har the rare genra *Arhipidothrips* Bagnall, 1932 (Faure, 1941) and *Rhipidothripiella* Bagnall, 1932, as its relatives. Other members of this group are *Euceratothrips* Hood, 1936, *Lamprothrips* Moulton, 1935, *Pseudaeolothrips* Bagnall, 1932, and the very large, world-wide genus *Aeolothrips*. Aside from this last-mentioned genus, extremely few specimens have ever been taken and, at present, it is impossible to evaluate the group as a whole. We believe the members of the genus to be predaceous (see also Bagnall and John, 1935), feeding on the larvae of other thrips as *Anaphothrips*, *Chirothrips*, *Limothrips*, etc. *Rhipidothrips* appear to reach the peak of seasonal abundance at the time the larvae of the above mentioned genera are most numerous on grains and grasses.

Key to the Species of Rhipidothrips

1. Antennal segment II yellow; dorsum of head with a distinct collar of polygonal reticulations at posterior (fig. 4) ..... *gratiosus*
– Antennal segment II brown or grey; dorsum of head transversely striate..2
2. Forewing of macropterous forms with a brown cross-band; abdominal segments IV and V white; antennal segment IV white ..... *cinctus*
– Forewing without cross-bands; abdominal segments otherwise colored or uniform brown; antennal segment IV pale yellowish brown to dark brown 3
3. Large species, body length 2.5 mm.; length of antennal segment III .087 mm., VIII .008 mm.; tip of antennal segment III dark brown ....*kellyanus*
– Smaller species, body length about 1.6 mm.; antennal segment III, .064 mm., VIII, .013–.020 mm.; III, yellow 4
4. Bristles behind eyes few, weak; intercollar bristles weak. Transverse striations on dorsum of head uniform, one line heavier than remainder, giving the appearance of a posterior collar (fig. 3).....*niveipennis*
– Cluster of short stout bristles behind eyes, intercollar bristles strong; striations on dorsum of head forming a collar-like appearance at posterior (condition unknown in *cahirensis)*; remainder of surface weakly striated (fig. 1) ..... *brunneus* and *cahirensis*

DISCUSSION OF THE SPECIES

Rhipidothrips brunneus Williams

1913. Williams, C. B. Jour. Econ. Biol. 8 (4); 216–218.

1926. Priesner, H. Thys. Eur. Wagner. Vienna. Page 97.

Female (brachypterous). Body dark brown with red subhypodermal pigment which does not extend into the appendages. Distal portions of tibiae and all of tarsi are yellow. Wing stubs (fig. 10) faint smoky grey. Antennal segments are colored as follows: I, dark brown; II, dark brown, shading to yellowish brown at tip; III, yellow; IV, yellow, shading to light brown at tip; V–IX, dark brown. *Head* with cheeks slightly arched and a cluster of short spines on margin posterior to eyes, about as long as wide (fig. 1). Three ocelli placed in a triangle, with one pair of moderately

long bristles placed just outside an imaginary line drawn from anterior ocellus to each posterior one. Anterior ocellus minute. Surface of head faintly cross-striate, heavier along posterior margin forming a collar. Maxillary palpi three-segmented and labial palpi four-segmented. Mouthcone short and blunt. Eyes normal and extending ventrally somewhat beyond the dorsal posterior margin. Sensory areas on antennal segments III and IV are on venter at distal end and are lense-shaped (fig. 5), that on segment IV extending halfway around segment; two simple, slender cones on each of segments V and VI, and one on VII. *Pronotum* slightly wider than long and wider across anterior margin than posterior, with a lateral suture extending two-thirds of its length on each side (fig. 1). One moderately long bristle at each lateral posterior angle approximately at the posterior end of above-mentioned suture; one short bristle at each anterior-lateral margin, directed forward, and two or three pairs along posterior margin. A short irregular line or thickening occurs in the center and very faint cross-striations are evident. Fore legs are short and heavy. The heavy claw, typical of the family, is present on the fore tarsus and at the tip of the tibiae are two heavy spines on the interior, one being more in the nature of a spur. The ovipositor is up-curved and no other distinguishing characteristics appear on the abdomen.

Female (macropterous). Our study is based on only one California macropterous specimen. This form is slightly larger than the brachypterous forms, and the setae are somewhat darker and longer. The short, thick bristles behind the eyes and on the lateral margin of cheeks are present. The reticulations on the head and pronotum and general coloration do not vary significantly. For comparison with *niveipennis* particularly, we give the measurements (mm.): head, length, 0.202, width, 0.190; interocellar bristles, 0.035–0.038; pronotum, length, 0.175. width, 0.297; bristles at posterior lateral margins of pronotum, 0.044–0.048; forewing, length, 0.981, width at center, 0.135; antennal segments, length I, 0.035; II, 0.051; III, 0.068; IV, 0.064; V, 0.057; VI, 0.048; VII, 0.038; VIII 0.017; IX, 0.009. Total body length, 2.05. Cross veins are absent in the posterior third of the fore wing. The posterior third is colored a smoky brown, producing a faint longitidunal band (fig. 12). Scalon (1931) first mentioned this form which obviously is very rare.

This form is close to *niveipennis* as also pointed out by Speyer. We have compared it with four specimens of the Reuter species (det. by Priesner) and find that in the European specimens the setae are weaker and colorless, the interocellars are 0.019–0.022 mm. long, the posterior lateral pronotals, 0.032–0.041 mm. and the forewing smaller, 0.864 mm. long, 0.094 mm. wide at center. The cluster of short, stout bristles behind the eyes are entirely absent or extremely weak.

Measurements (in millimeters) of brachypterous female: head, length, 0.192, width, 0.198; pronotum, length, 0.148, width (at anterior margin), 0.210; interocellar bristles 0.028, those at posterior lateral angle of pronotum

.041–.043; total body length, 2.01. Anetnnal segments, length, I, 0.032; II, 0.048; III, 0.064; IV, 0.051; V, 0.051; VI, 0.041; VII, 0.032; VIII, 0.014; IX, 0.011.

Male – unknown.

Material studied: Sussex, England, two females; Albany, Oregon, three females; Granger, Oregon, five females; Corvallis, Oregon, 14 females (Moulton, 1939); Vacaville, Fairfield, Skaggs Island, and Palo Alto California, 43 brachypterous females, and one macropterous female from Skaggs Island.

Hosts: Grasses, oats, *Osmaronia.*

Distribution: England, Siberia, Austria, France, North America: Oregon, California. The California records are new.

Rhipidothrips cahiresis Priesner

1932. Priesner, H. Bul. Soc. Roy. Ent. Egypt 25:45-46.

It has not been possible to study either of the two brachypterous females on which this species was based. Comparing the description with *brunneus* to which it is very closely related, we find the principal difference to be that Priesner's species is larger, and has longer antennae. When a longer series is available from this part of the world for comparison with brachypterous forms of *brunneus*, it will be possible to more properly evaluate *cahirensis*. In the meantime it must be keyed out with *brunneus*.

This species was based on specimens taken on "grasses on March 27, 1930, near the Pyramids at a canal bank on the Sakkara road, in Giza Province."

Rhipidothrips cinctus Hood

1918. Hood. Mem. Queensld. Mus. 6:121-122.

This species is known apparently only from the two original females. It is readily distinguishable from all others described up to the present time by the cross-band on the forewing and the bicolorus abdomen. The important recognition characters appear to be as follows: Antennal segments III and IV and abdominal segments IV and V nearly white; pronotum smooth; maxillary palpi three-segmented; macropterous, forewing with brown cross-band in distal third, apex brown. The describer gave the length of the nine antennal segments in microns as follows: 30, 48, 83, 72, 45, 31, 33, 20, 15; total 0.377 mm.

As far as we know the species has not been taken since its original collection at Cooktown, North Queensland, February 4 and 24, 1912, sweeping, by A. A. Girault. Mr. George Mack,

director of the Queensland Museum states that no types are on deposit at that institution. We have not seen the species.

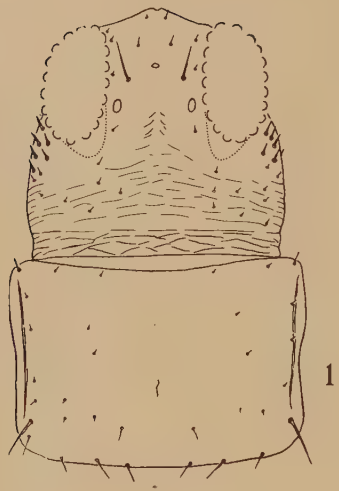
RHIPIDOTHRIPS GRATIOSUS Uzel

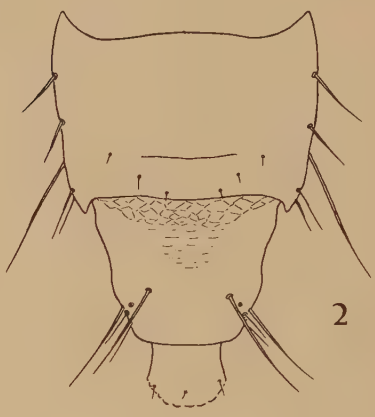
1895. Uzel, H. Mongr. Ord. Thys. Koniggratz. Pages 66–68, figs. 42–43.
1926. Priesner, H. Thys. Eur. Wagner. Vienna. Page 96.

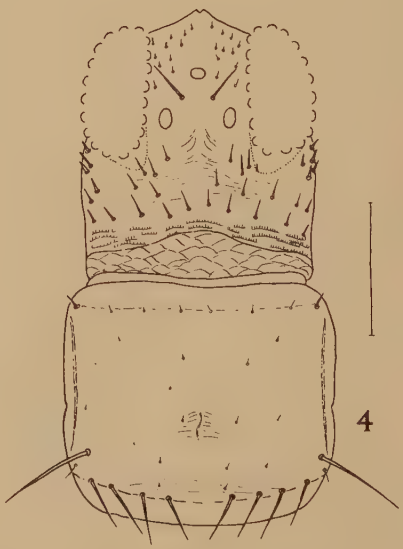
Female (macropterous). Body light brown, protonum yellow with an irregular "x"-marking of brown in center, head dark brown. Tarsi all yellow, distal and basal portion of tibiae yellow, as well as basal portion of femora. Wings light grey with a smoky brown band longitudinally along posterior fourth of forewing. Antennal segments colored as follows: I, dark brown, II, yellow with dark brown ring at base, III, brownish yellow, dark at tip, IV, smoky brown with dark ring at tip, V–IX, dark brown. Sensory areas on segments III and IV extending two-thirds around segment (fig. 6). *Head* longer than wide, cheeks slightly curved outwards with 3-4 moderately heavy britsles at lateral margins behind eyes. Three ocelli present, normal, with one pair of long seta (.038 mm. in length) on a line with or within an imaginary line drawn between the anterior ocellus and each posterior one. Eyes normal, not enlarged, but extending somewhat posteriorly beyond the hind dorsal margin. Minor setae longer and more numerous on head than on *brunneus*. Reticulations heavy and particularly prominent on posterior portion of head thus forming a "collar." Microtrichia present, directed forward, on reticulations immediately anterior to collar. Maxillary palpi three-segmented and labial palpi four-segmented (figs. 8, 9). Sensory areas on antennal segments III and IV of the same type and similarly placed as on *brunneus* but larger, in addition two or three faint circular areas are present on the venter; those on the remaining segments are as in *brunneus*. *Pronotum* wider than long. One small seta at each anterior lateral angle and a scattered row of somewhat shorter setae along anterior margin. One long seta (.064–.075 mm. in length) on lateral margin slightly forward of posterior laterial angle and three or four pair of shorter bristles evenly spaced, along posterior margin. The remainder of pronotum with scattered, irregularly spaced, minor setae. Striations appear weakly at the center and posterior margin. The lateral suture, so prominent in *brunneus*, is very faint in *gratiosus* but the small mid-dorsal line is present. Fore legs normal with a heavy tarsal hook on the underside, directed inward (fig. 11). Tibial "spurs" as in *brunneus* but somewhat less strongly developed. *Wings* as in *brunneus* (macropterous form) but slightly longer. Ovipositor normal.

Measurements (mm.) of female: head, length, 0.195, width, 0.174; pronotum, length, 0.131, width, 0.198; forewing, length, 0.891, width (at center), 0.135; total body length (distended), 1.94. Antennal segments, length, I, 0.013; II, 0.210; III, 0.090; IV, 0.067; V, 0.054; VI, 0.044; VII, 0.035; VIII, 0.012; IX, 0.009.

Male. Bagnall (1913) and Morison (1948) record males from England. Uzel, in his original description, stated that the male was smaller and more slender than the female, similarly colored and the dorsum of the first abdominal segment with the usual two ridges present. We have studied seven males and note no claspers or thorns or dimorphism in the antenna.





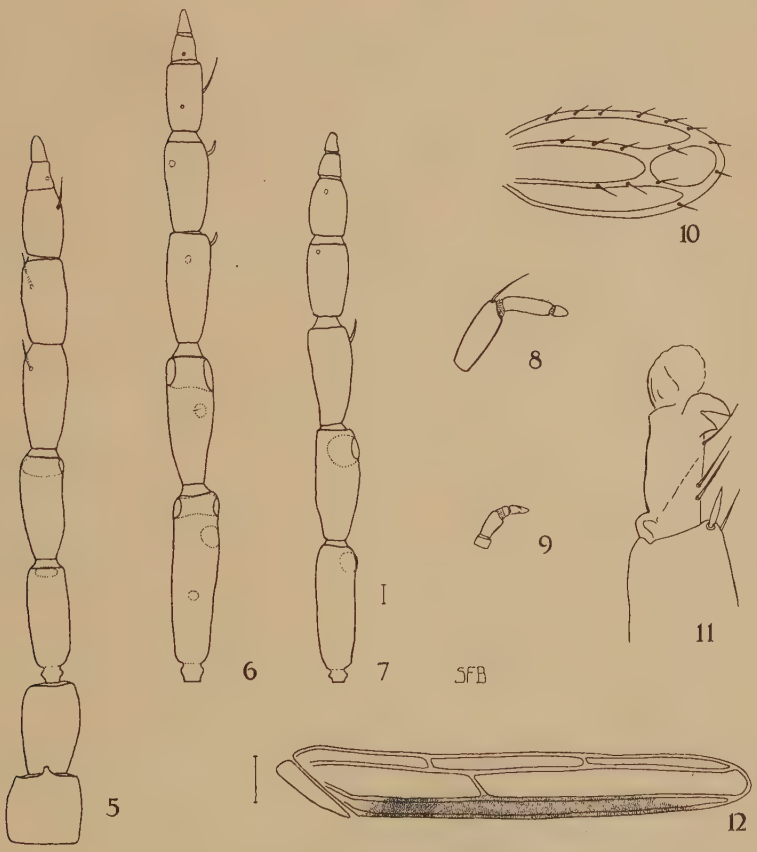


EXPLANATION OF FIGURES

Fig. 1. Head and pronotum of *Rhipidothrips brunneus* Wms. Fig. 2. Terminal abdominal segments of *Rhipidothrips gratiosus* Uzel, male. Fig. 3. Head and pronotum of *Rhipidothrips niveipennis* O. M. Reuter. Fig. 4. Head and pronotum of *Rhipidothrips gratiosus* Uzel. Fig. 5. Antenna of *Rhipido-*

To our knowledge there are no micropterous, brachypterous, or apterous forms of this species.

Material studied: Cyprus, 1 female: Switzerland, 1 female; France, 5 females, 5 males; Austria, 7 females, 2 males; North America, California, 24 females.



thrips brunneus Wms. Fig. 6. Antenna of *Rhipidothrips gratiosus* Uzel. Fig. 7. Antenna of *Rhipidothrips niveipennis* O. M. Reuter. Fig. 8. Maxillary palpus of *Rhipidothrips gratiosus* Uzel. Fig. 9. Labial palpus of *Rhipidothrips gratiosus* Uzel. Fig. 10. Fore wing pad of *Rhipidothrips brunneus* Wms. Fig. 11. Fore tarsus and tip of tibia of *Rhipidothrips gratiosus* Uzel. Fig. 12. Fore wing of macropterous form of *Rhipidothrips brunneus* Wms. Scale: figs. 1, 3, 4, 10, 12, line equals 0.1 mm.; figs. 2, 5, 6, 7, 8, 9, 11, line equals 0.01 mm.

Hosts: Barley, oats, wild grasses, "flowering Dicotyledons", *Coronilla varia.*

Distribution: England, France, Bohemia, Hungary, Austria, Switzerland, Cyprus.

New records: North America; California, near Beaumont, June 6, 1949, R. M. Bohart; San Luis Obispo, Pismo Beach, and Zaca Mt., April 24, 1951, S. F. Bailey and R. M. Bohart. These are the first records of the species in North America.

RHIPIDOTHRIPS KELLYANAS Bagnall

1924b. Bagnall, R. S. Ann. Mag. Nat. Hist., ser. 9, 13:584-585.

Bagnall based this Australian species on two females, which from the description, is distinctly different from *cinctus*. The coloration of the forewings is typical of European species and the reticulated collar and the mottling on the head remind one of *gratiosus*. The peculiar shortening of the eighth antennal segment is a unique character but since this measurement is based on only one perfect specimen, it is impossible to say whether or not this is reliable. The writer recalls discussing this trips with the late Dudley Moulton and he was of the opinion it did not belong in *Rhipidothrips*. Nothing further can be done with this species at present.

The two females were collected on April 22, 1923, on *Eucalyptus leucoxylon* by R. Kelly, Mount Lofty Ranges, South Australia. Supposedly the slide is in the Bagnall collection in the British Museum, London, England.

RHIPIDOTHRIPS NIVEIPENNIS O. M. Reuter

1899. Reuter, O. M. Act. Soc. Faun. Flor. Fenn. 17(2):30-31.

1926. Priesner, H. Thys. Eur. Wagner. Vienna. Pages 96-97.

Female (macropterous). Body dark brown with red subhypodermal pigment. Distal portions of tibiae and all tarsi yellowish white. Wings normal, nearly colorless, faintly yellowish brown near base of forewings and along costal vein. Antennal segments colored as follows: I and II dark brown, III and IV yellow, V brownish yellow, VI–IX brown. Head with cheeks nearly straight with very weak spines, slightly longer than wide (fig. 3). Three ocelli, anterior one smaller than laterals; surface completely cross-striate, the lines anastomosing. Compound eyes prolonged ventrally; inter-ocellar bristles short. Maxillary palpi three-segmented; labial palpi four-segmented. Mouthcone extending slightly beyond the center of the prothorax. Sensory areas on antenna ventral, oval, that on IV larger than on III, placed near tip; two small simple cones on each of segments V–VII (fig. 7).

Pronotum slightly wider than long; lateral suture present; surface lightly cross-striate; one moderately heavy bristle at posterior lateral angles. One pair on posterior margin at each side of center, one short seta at each

anterior lateral angle, directed forward. Fore legs normal, with claw on basal tarsal segment and a spur at tip of tibia. Abdomen typically aeolothripoid in shape, ovipositor up-curved.

Measurements (in millimeters); head, length, .041, width, 0.38; pronotum, length .160, width, .166; total body length, 1.33. Antennal segments (length): I,.028; II, .041; III, .072; IV, .057; V, .054; VI, .040; VII, .030; VIII, .013; IX, .008.

Male: not available for study; very rare.

Material studied: Three females (loaned from Hood collection) det. H. Priesner, coll. Ahlberg. Sweden, Experiment alfältet, May 30, 1919. Host unknown (probably grasses). One female collected by Hukkinen, det. zy Priesner with no locality data.

Hosts: Grasses, *Abies*, *Rubus*, *Galium*, *Solidago*, *Convallaria*, *Taraxacum*, *Anthriscus*, *Urtica*, *Hieracium*, and *Alopecurus*.

Distribution: Sweden, Finland.

Hukkinen (1935, 1942) reports both macropterous and brachypterous forms from Finland. Speyer and Parr (1951) report studying one of Hukkinen's specimens which lacks the posterior lateral bristles on the pronotum, thus agreeing with the original description. The specimens we have studied all have setae on the pronotum as shown in fig. 3. Neither of the above authors (or Williams, 1916) mention other important diagnostic characters such as post-ocular and interocellar setae as well as the nature and extent of the dorsal reticulations on head and pronotum. Speyer points out that Reuter may have had two species before him, one of which is what we now believe to be the macropterous form of *brunneus*. However, we note differences in the two forms of *brunneus* and also point out that the brachyterous form (Hukkinen, 1935, 1942) of *niveipennis* has not been fully described.

Some years thrips are known to produce many winged forms and the following season they will be scarce. Not until a large series of the two forms of these two species are collected and studied can this matter be definitely settled. When only a few specimens are available, it is possible that the individuals studied by both Reuter and Speyer are atypical.

RHIPIDOTHRIPS UZELIANUS Bagnall

1934. Bagnall, R. S. Ann. Mag. Nat. Hist., ser. 10, 14:482.

This enigmatic species from Switzerland has not been clearly defined and has to our knowledge not been taken since Bagnall described it. The author distinguished it from *gratiosus* solely on minor differences in the size of the wings ,head, tibiae, and shorter

intermediate antennal segments. We have not seen this species but consider it of very doubtful validity. The only significant difference in the measurements given by Bagnall is in the length of antennal segment IV; that of *gratiosus* being given as 80 microns and that of *uzelianus* as 59. In a series of 25 female *gratiosus* which we have studied the length of this segment varies from 57 to 80, averaging 71.5 microns.

Morison (1948) lists this species from England, quoting Bagnall, but apparently did not collect it himself or critically study Bagnall's material.

In our collection we have one female of *gratiosus* taken and determined by Bagnall at Zurich, Switzerland, with the same collection data as the unique specimen of *uzelianus* with the exception of the host being "oats" instead of "*Brachypodium*". It is a typical specimen of *gratiosus* with antennal segments of the following lengths: 28, 48, 99, 80, 57, 48, 35, 16, 11. Nothing further can be done to more definitely place this species until the type is studied and more material collected.*

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* Since this paper was prepared, E. R. Speyer has called my attention to his report of 1951 (Speyer and Parr, 1951) in which he has studied the type and already synonymized it with **gratiosus.**

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USE OF BIRD NEST BY BUMBLEBEE

A nest of a bumblebee, *Bombus caliginosus* (Frison), was found on May 1, 1954, in Berkeley, California in an old nest made by house finches [*Carpodacus mexicanus* (Müller)] in 1953 or possibly 1952. The nest was placed about 15 feet above the ground against the redwood siding of a house and was supported by twigs of a broad-leaved ornamental shrub on the northeast side of the house. When found, the bird nest was occupied by a queen bee and contained a number of recently formed brood cells and a pollen mass within which were present six larvae, three pupae, and two egg masses of 9 and 10 eggs, respectively. Also present was a small lepidopterous larva *Hofmannophila pseudospretella* (Staint.)[1]. A new brood cell contained mites of the family Laelaptidae[2] of the genus *Hypoaspis (s.l.)*.

The nest chamber of the bee was within the soft, collapsed mass of bird nest material which was originally the lining. This consisted of thin fibers, chiefly grass, and many small wads of cottony and downy material apparently collected from plants such as willows and from *Eucalyptus* flower-heads. The entrance to the bee's nest chamber was on top of the bird nest and led to a main chamber an inch from the surface occupied by the pollen mass. The new cell was inserted into another part of the nest and was connected with the main passage in front of the pollen mass. The bird nest was protected from rain by both the supporting shrub and a roof overhang.

The over-winter use of a bird nest by *Bombus* is apparently unrecorded, hence this note.—Frank A. Pitelka, *Museum of Vertebrate Zoology, University of California, Berkeley.*

[1] Identified by H. W. Capps
[2] Identified by D. P. Furman

NEW RECORDS AND SPECIES OF MILLIPEDS FROM THE WESTERN UNITED STATES AND CANADA

NELL B. CAUSEY
Fayetteville, Arkansas

Dr. and Mrs. Herbert W. Levi and Mr. Joe Gorman collected the millipeds reported here and kindly made them available to me. Both collections are important because they contain several species previously known only from the type collections. Holotypes will be deposited in the American Museum of Natural History and paratypes will be retained in the author's collection.

ORDER COLOBOGNATHA

FAMILY ANDROGNATHIDAE

BRACHYCYBE PRODUCTA Loomis

Brachycybe producta Loomis, 1936. Proc. U. S. Nat. Museum, 83:367–368, fig. 32, h, i.

One female of 53 segments, width 3 mm., was collected by Mr. Gorman in Marin County, California, April 2, 1952.

ISCHNOCYBE PLICATA Cook and Loomis

Ischnocybe plicata Cook and Loomis, 1928. Proc. U. S. Nat. Museum, 72: 22–24, pl. 1, fig. 6.

One female of 57 segments was collected by Mr. Gorman at Genosee, Plumas County, California, April 13, 1952.

EUCYBE CLARUS Chamberlin

Eucybe clarus Chamberlin, 1941. Bull. Univ. Utah, Biol. Ser., 6(4):3.

One female of 58 segments, length about 20 mm., width 1.4 mm., agrees with the description of the female holotype except that there are three transverse rows of tubercles on the collum. Collected by the Levis at Patrick Creek, Del Norte County, California, July 4, 1951.

ORDER POLYDESMOIDEA

FAMILY XYSTODESMIDAE

HARPAPHE HAYDENIANA (Wood)

Polydesmus (Leptodesmus) haydenianus Wood, 1864. Proc. Acad. Nat. Sci. Philadelphia (1864):10; 1865, Trans. American Plilos. Soc. 13:226–227, fig. 57.

Leptodesmus haydenianus (Wood), Bollman, 1893. Bull. 46, U. S. Nat. Museum, 122.

Harpaphe haydeniana (Wood), Cook, 1904. Harriman Alaska Exped., 8(1): 59–60, pl. 3, figs 4a, 4b, 4c.

A few adults and numerous larvae of stadium VII were collected by the Levis from moss and wet leaves along the shores of bodies of fresh water at Cape Perpetua, Lincoln County, Oregon, July 8, 1951.

HARPAPHE POTTERA Chamberlin

Harpaphe pottera Chamberlin, 1949. Proc. Biol. Soc. Washington, 63:129, fig. 10.

Several adult specimens were collected by Mr. Gorman at Low Pass Creek, March 25, 1951; on Brock Mt., April 16, 1952; and at Madison Creek, September 2, 1951, all in Shasta County, California. Prefemurs of legs with shorter spines than in H. *haydeniana*.

HYBAPHE TERSA Cook

(Figure 1)

Hybaphe tersa Cook, 1904. Harriman Alaska Exped. 8(1):58–59, pl. 3, fig. 3a.

Mr. Gorman collected specimens of both sexes April 16, 1932, at Low Pass Creek and on Brock Mt., both in Shasta County, California. The color is striking, with the prozonites green and the metazonites red-orange. The femoral branch of the male gonopods is flattened and easily bent. In each specimen the apex of the femoral branch is slightly different, varying from acute, as illustrated by Cook, to rounded (fig. 1) in some and finely bifid in two. Another interesting variation is seen in the keels of segments 2 through 4; in some specimens there is a small but distinct tooth on the anterior angle of each of these keels, while in others there is only a trace of the tooth on one or more of these keels. Keels of the collum sometimes have a similar small tooth. Dorsum moderately arched, with low-placed keels on all segments except the last. Keels of collum obtuse, lightly rounded; keels of segments 2 through 4 directed slightly cephalad, the caudal margins convex; keels of segments 5 through 16 rectangular, the caudal margins almost straight; keels of segments 17 through 19 increasingly reduced at the cephalic angles and produced at the caudal angle, with the eighteenth slightly acute and the nineteenth more acute and about half as large as the eighteenth. Prozonites of middle body segments much exposed. Caudal spine narrow, truncated. Legs from middle of body back with short, stout spine on the second article.

Tubaphe Causey, new genus

Telopodite of gonopods two-pronged, with both prongs simple as in *Hybaphe* Cook, 1904 and *Isaphe* Cook, 1904. Distinguished from both genera by the absence of keels on segments 6, 8, 11, and 14 and by the presence of only rudimentary keels on the poriferous segments. Coxae and prefemurs of legs spined, while in *Hybaphe* only the prefemurs are spined; leg spination unknown in *Isaphe*.

Genotype. Tubaphe levii Causey, new species.

Tubaphe levii Causey, new species

(Figures 2–4)

Male holotype. Colors faded, but the keels and perhaps the legs are red and the dorsum is brown. With the middle and posterior keels either absent or greatly reduced, the appearance is almost juloid. Keels of segments 1 through 4 are moderately large, obliquely depressed, with the angles rounded and the lateral margins welted. Beginning abruptly with the fifth segment and continuing on all of the poriferous segments, the keels are scarcely more than longitidunal welts through which the pores open laterad; there is but a slight trace of a welt on the nonporiferous segments (Fig. 2). Keels of segments 14 through 18 are slightly larger and produced caudad; on segment 19, of which very little is exposed, the keels are much reduced; apex of caudal spine narrow, truncated (Fig 3). Intrasegmental sutures distinct and lightly corrugated; tergites smooth otherwise. Prozonites of middle body segments much exposed. Sternites smooth and glabrous. Coxae of last legs well separated. Prefemurs of legs from middle of body back with stout, sharp spines and coxae with stout, blunt spines.

Telepodites of gonopods subparallel and contiguous at the femoral region, with the apices of the tibio-tarsi reaching in front of the sixth coxae. In lateral view each of the two prongs appears to form a semicircle; the curvature as seen in medio-cephalic view is shown in Figure 4; the curvature is altered by drying. Coxal region elongated, with the usual medial coxal hook; femoral region elongated and separated from the tibio-tarsus by an oblique suture. The long, attenuated femoral process arises from the medial surface and curves dorso-cephalad. *Width* 4 mm.

Female paratype. Somatic characters agree with those of the male except that the width is 5 mm. and the length is 33 mm.

Holotype, male: GRAVES CREEK CAMP GROUND, OLYMPIC NATIONAL FOREST, JEFFERSON COUNTY, WASHINGTON; rain forest. The Levis collected 1 male and 2 females July 12, 1951.

FAMILY NEARCTODESMIDAE

NEARCTODESMUS OLYMPUS Causey

Nearctodesmus olympus Causey, (in press). Ann Ent. Soc. America.

Several adults and larvae of stadium VII were collected by the Levis at Cape Perpetua, Lincoln County, Oregon, July 8, 1951. The apex of the lateral prefemoral branch of the gonopod bears three minute prongs instead of the four in the holotype from Callam County, Washington.

FAMILY POLYDESMIDAE

SCYTONOTUS AMANDUS (Chamberlin)

Polydesmus amandus Chamberlin, 1910. Ann. Ent. Soc. America, 3(4): 249–250; pl. 38, fig. 6; pl. 39, fig. 1.

Several adults and larvae of stadium VI were collected by the Levis from the Gros Verte area, Moose, Teton County, Wyoming, July 26, 1950.

Brachydesmus (Brachydesmus) yosemitensis Causey, new species
(Figure 5)

Distinguished from *B. hastingus* Chamberlin, 1941, the most closely related North American species, by the larger size and details of the gonopods. Gonopods especially distinctive in the irregularly serrated margin of the femoral lobe and the hooked lobe near the hair pad.

Male holotype. Color red-brown. Caudal margin of metatergites straight or slightly curved, with the caudal row of setae prejecting beyond the margin. keels finely dentate laterad, sometimes obscurely so, with five uneven serrations on the poriferous segments and four on the nonporiferous. Pores open laterad on longitudinal tubercles. Metazonites with three rows of low, setiferous, often indistinct tubercules, with 12 setae in each row. Transverse depressions between rows of tubercles are more distinct than the longitudinal depressions. Tubercles on keels tend to be indistinct. On most segments there are eight large tubercles in the anterior row, eight smaller ones in the middle row, and 12 little ones in the marginal row. Tubercles on eighteenth segment indistinct. Exposed parts of prozonites smooth; a raised transverse band separates the pro- and metazonites. Anal valves and venter with abundant short setae. Legs of segments 6, 7, and 10 unmodified, the other legs lost. Gonopods as shown in figure 5. *Width* 1.3 mm., estimated *length* 11 mm.

Holotype male: VERNAL FALLS, YOSEMITE NATIONAL PARK, CALIFORNIA. One male with the head, first five segments, and most of the legs lost was collected by Mr. Gorman February 2, 1952.

ORDER SPIROBOLOIDEA

FAMILY SPIROBOLIDAE

CALIFORNIBOLIS PONTIS Chamberlin

Californibolus pontis Chamberlin, 1949. Jour. Washington Acad. Sci., 39(5): 166, figs. 18, 19.

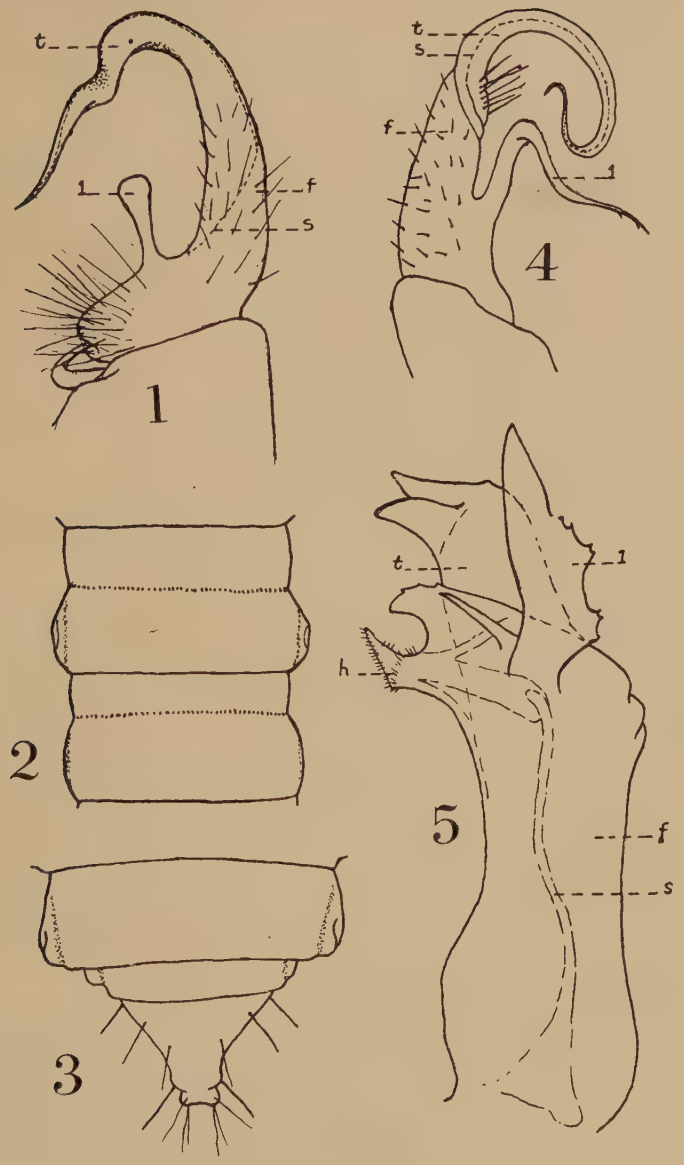
One male of 52 segments, width 5.2 mm., was collected by Mr. Gorman at Low Pass Creek, Shasta County, California, April 16, 1952.

CALIFORNIBOLIS UNCIGERUS (Wood)

Spirobolus uncigerus Wood, 1864. Proc. Acad. Nat. Sci. Philadelphia, (1864): 15; 1865, Trans. American Philos. Soc., 13:209–210, fig. 36.
Tylobolus uncigerus (Wood). Cook, 1904. Harriman Alaska Exped. 8(1):67.
Californibolus uncigerus (Wood). Chamberlin, 1949. Jour. Washington Acad. Sci. 39(5):166.

EXPLANATION OF FIGURES

Hybaphe tersa Cook. Figure 1. Right gonopod, cephalic view.
Tubaphe levii Causey, new genus, new species. Figure 2. Segments 10



and 11, dorsal view. Figure 3. Segments 18–20, dorsal view. Figure 4. Left gonopod, medio-cephalic view.

Brachydesmus (B.) yosemitensis, Causey, new species. Figure 5. Left gonopod, lateral view.

f, femur; h, hair pad; l, femoral lobe; s, seminal canal; t, tibio-tarsus.

One male of 52 segments, width 6.4 mm., was collected by Mr. Gorman at Low Pass Creek, Shasta County, California, April 16, 1952.

AXOBOLUS ERGUS Chamberlin

Axobolus ergus Chamberlin, 1949. Jour Washington Acad. Sci., 39(5):163, figs. 5–7.

One male of 52 segments, width 6.3 mm., was collected by Mr. Gorman at Rich Bar, Plumas County, California, April 14, 1952.

ORDER JULOIDEA

FAMILY PARAIULIDAE

ORIULUS MEDIANUS Chamberlin

Oriulus medianus Chamberlin, 1940. Bull. Univ. Utah, Biol. Ser., 5(7):7–8, pl. 3, figs, 21, 22.

Several collections of adult specimens were taken by the Levis in Teton County, Wyoming, and Fremont County, Idaho, in June, July, and August, 1950. Only larvae were taken in Custer State Park, South Dakota, June 25, 1950.

TAIULUS TIGANUS (Chamberlin)

Paraiulus tiganus Chamberlin, 1910. Ann. Ent. Soc. America, 3(4):254–256, pl. 40, fig. 8; pl. 41, figs. 1–3.

Taiulus tiganus (Chamberlin). Chamberlin, 1940. Bull. Univ. Utah, 30(11):18.

Several adult specimens were collected by the Levis at Pines Camp Ground, Mt. Nebo, Juab County, Utah, August 25, 1951.

TAIULUS sp.

Numerous larvae were collected by the Levis from fern fronds in a rain forest at Cape Perpetua, Lincoln County, Oregon, July 8, 1951. Mr. Gorman collected larvae at Burney Falls, April 15, and mature females and larvae at Madison Creek, Shasta County, California, September 2, 1951.

FAMILY BLANIULIDAE

UTOIULUS UTUS (Chamberlin)

Nemasoma uta Chamberlin, 1912. Ann Ent. Soc. America, 5(2):162–163.

Utoiulus utus (Chamberlin). Chamberlin, 1943. Proc. Biol. Soc. Washington, 56:145.

Namasoma uta (Chamberlin). Chamberlin, 1951. Nat. Hist. Miscellany, No. 87, p. 9, fig 21.

Three collections, all males, were made by the Levis at Moran, Teton County, Wyoming, in July and August, 1950. Maximum length about 8 mm.

UTOIULUS LEECHI (Chamberlin)

Nemasoma leechi Chamberlin, 1951. Nat. Hist. Miscellany, No. 87, p. 10, fig. 20.

Several specimens were collected by the Levis from under rocks on a dry hillside, altitude 7100 feet, at Sunwapta Pass, Vaspar National Park, Alberta, Canada, August 10, 1951.

THE DORSAL HAIRLESS SETAL RING OF MOSQUITO PUPAE

(Diptera: Culicidae)

JOHN N. BELKIN
University of California, Los Angeles

The "dorsal hairless setal ring", as the name implies, resembles an alveolus of a bristle but lacks a projecting seta. In most mosquito pupae there is a pair of these structures on the dorsum of each of the abdominal segments III to V, usually in more or less close association with one of the regular bristles. In some forms the "setal ring" is lacking on segment III *(Wyeomia)* or segment V (subgenus *Rachisoura* of *Tripteroides)* and may be even completely absent *(Trichoprosopon, Sabethes)*. This "setal ring" has usually been interpreted as a reduced bristle, and some workers have been of the opinion that, on segment II it is represented by a fully developed hair and that on the segments beyond V it has been completely lost (Baisas, 1938; Edwards, 1941; Penn, 1949; Darsie, 1949, 1951). Such an opinion appears to be supported by the fact that in the pupae of many common mosquitoes there is one more pair of fully developed hairs on the dorsum of segment II than on the following segments. On the other hand, the above mentioned workers did not study the chaetotaxy of the venter of the abdomen and it has been shown by Knight and Chamberlain (1948) beyond any doubt that the extra hair of the dorsum of segment II is actually one of the ventral hairs (10) which has moved dorsad in these forms while in several groups it has retained its primitive ventrolateral opposition (e.g. *Chagasia, Sabethes, Wyeomyia, Limatus, Topomyia, Harpagomyia, Tripteroides* [*Rachisoura*], *Culiseta, Ficalbia, Aedeomyia, Mansonia, Opifex, Deinocerites)*. Accordingly Knight and Chamberlain assigned the designation O to the "dorsal hairless setal ring" and did not con-

sider that it was represented by a serial homologue on abdominal segments II and VI–VIII. Their inclusion of this structure in the terminology and its name presupposes that the "setal ring" has arisen as a modification of a regular bristle. In my review of the pupal chaetotaxy (Belkin, 1952), I disregarded this structure completely for it has apparently no homologue in the larva and does not seem to fit in at all in the general chaetotaxy pattern, but I failed to indicate my reasons for this action. Additional evidence is now at hand and indicates that the "setal ring" is probably a sense organ and has no homology at all with the regular bristles and should therefore be disregarded in the nomenclature of the chaetotaxy.

Recently, in studying the pupae of the anophelines of California, I have encountered a race of *A. occidentalis* Dyar & Knab, 1906 in which this "dorsal hairless setal ring" occurs sporadically on abdominal segment II. Of ten specimens examined two showed this structure on both sides of the segment and two additional ones on the right side only. The setal rings are indistinguishable from those of the following segments, occur in the same position on the segment, and are located between hairs 4 and 5. This evidence is a further support for the interpretation that the "setal ring" is not represented by one of the fully developed hairs on abdominal segment II, for the hair interpreted as homologous with the setal ring (hair 4) by Baisas, Penn and Darsie is also fully developed on segment II along with the "setal ring".

The question still remains as to the nature and origin of the "setal ring". Two general explanations are possible: either it is developed from a regular bristle or it is a new structure bearing no relationship to the bristles. The first alternative will be examined first. There is no way in which the "setal ring" can be homologized directly with any regular hair without disrupting completely perfectly evident homologies already established but this structure may have arisen either as a duplication of one of the hairs or it may represent one of the transitory larval hairs that are occasionally carried over to the pupa. I have noted earlier (Belkin, 1952:128) that both phenomena occur rather frequently in the pupae of some mosquitoes and that some of these anomalous hairs are represented by alveoli only. In all duplications observed by me the twin hairs always retain a very close relationship and generally exhibit a similar degree of development. If the "setal ring" has arisen as

a result of the duplication of one of the dorsal hairs, I believe that it is very likely that it would have remained in close association with this hair on all segments and in all mosquitoes. Such is not the case, for it may be variously associated with hairs 3, 4 or 5 or any combination of these, although it may seem at first glance to be most frequently associated with hair 5. It appears rather that the "setal ring" has a characteristic position on each segment and in each group, and that its apparent association with a particular hair is due secondarily to the presence of that hair in the same general area. The transitory larval hairs which are occasionally retained in the pupa are all ventral in position, but there is a possibility that one of them may have migrated to the dorsal surface as has been the case with hair 10 on abdominal segment II of some forms. That the "setal ring" could not have arisen through the retention of one of these transitory hairs is demonstrated in the pupae of *A. occidentalis*, *A. punctipennis* (Say), 1823 and *A. freeborni* Aitken, 1939 in which both pairs of transitory hairs may be occasionally present on the venter while the "setal ring" is present simultaneously on the dorsum (Belkin, 1953). Finally, if the "setal ring" has arisen as a result of either a duplication or a retention of a transitory hair one would expect occasional anomalies of this structure which would be in the form of a reduced bristle. To date no such anomalies have been seen in the examination of over a thousand "setal rings". Thus it is probable that the "dorsal hairless setal ring" is new and peculiar to the pupal stage and bears no homology to any element of the chaetotaxy. On the chance that it did arise from one of the bristles, we should watch for anomalies.

At present nothing is known of the function of the "dorsal hairless setal ring". Its structure suggests a sense organ, possibly one associated with the orientation and the movements of the pupa, since it occurs on the segments exhibiting the greatest curvature in the abdomen. In this connection it is interesting to note that, in those sabethines (restricted to small containers of water) which possess very sluggish pupae, it may be completely absent *(Trichoprosopon, Sabethes)* or lacking on III *(Wyeomyia)* or V (subgenus *Rachisoura* of *Tripteroides)*. It would be of considerable interest to determine experimentally the function of this structure.

Since the "setal ring" apparently does not represent a reduced hair and since it appears to be a sense organ, I suggest that the

cumbersome and ambiguous term "dorsal hairless setal ring" be dropped in favor of the simpler "dorsal sensillum" and that it should not be included in the nomenclature of the pupal chaetotaxy. As pointed out above, its occurrence and distribution may be of value in separating mosquito groups and therefore it should be studied and recorded as in the past.

Addendum

In June, 1954, William A. McDonald of our Department noted in the fourth instar larva of *Culex tarsalis* Coquillett, 1896 a minute sensillum on abdominal segments III–V between and slightly cephalad of hairs 3 or 4. I have examined representative species in several genera and have found a similar sensillum in approximately the same or in a more cephalic, caudal or lateral position. Since there is a close correspondence between this larval sensillum and the pupal dorsal sensillum in regard to occurrence on specific segments and relation to hair 4, I consider these sensilla homologous.

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